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United States
Department of
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Natural
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Conservation
Service

Washington Basin Outlook Report April 1, 1999

USDA FOREST
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Basin Outlook Reports and Federal - State - Private Cooperative Snow Surveys

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How forecasts are made

Most of the annual streamflow in the western United States originates as snowfall that has accumulated in the mountains during the winter and early spring. As the snowpack accumulates, hydrologists estimate the runoff that will occur when it melts. Measurements of snow water equivalent at selected manual snow courses and automated SNOTEL sites, along with precipitation, antecedent streamflow, and indices of the El Niño / Southern Oscillation are used in computerized statistical and simulation models to prepare runoff forecasts. These forecasts are coordinated between hydrologists in the Natural Resources Conservation Service and the National Weather Service. Unless otherwise specified, all forecasts are for flows that would occur naturally without any upstream influences.

Forecasts of any kind, of course, are not perfect. Streamflow forecast uncertainty arises from three primary sources: (1) uncertain knowledge of future weather conditions, (2) uncertainty in the forecasting procedure, and (3) errors in the data. The forecast, therefore, must be interpreted not as a single value but rather as a range of values with specific probabilities of occurrence. The middle of the range is expressed by the 50% exceedance probability forecast, for which there is a 50% chance that the actual flow will be above, and a 50% chance that the actual flow will be below, this value. To describe the expected range around this 50% value, four other forecasts are provided, two smaller values (90% and 70% exceedance probability) and two larger values (30%, and 10% exceedance probability). For example, there is a 90% chance that the actual flow will be more than the 90% exceedance probability forecast. The others can be interpreted similarly.

The wider the spread among these values, the more uncertain the forecast. As the season progresses, forecasts become more accurate, primarily because a greater portion of the future weather conditions become known; this is reflected by a narrowing of the range around the 50% exceedance probability forecast. Users should take this uncertainty into consideration when making operational decisions by selecting forecasts corresponding to the level of risk they are willing to assume about the amount of water to be expected. If users anticipate receiving a lesser supply of water, or if they wish to increase their chances of having an adequate supply of water for their operations, they may want to base their decisions on the 90% or 70% exceedance probability forecasts, or something in between. On the other hand, if users are concerned about receiving too much water (for example, threat of flooding), they may want to base their decisions on the 30% or 10% exceedance probability forecasts, or something in between. Regardless of the forecast value users choose for operations, they should be prepared to deal with either more or less water. (Users should remember that even if the 90% exceedance probability forecast is used, there is still a 10% chance of receiving less than this amount.) By using the exceedance probability information, users can easily determine the chances of receiving more or less water.

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Washington Water Supply Outlook

April 1999

General Outlook

The month of March was a little drier than previous months in Washington. Water-year snowpack and precipitation levels remain above average in most all river basins in the state. Mountain snowpack above 3000-foot elevation has maintained the record setting levels from last month, however the snowpack below 3000-foot has dropped to below average levels in most basins. Higher than normal streamflows, with some potential flooding, can be expected throughout the spring and summer months.

Snowpack

The April 1 statewide SNOTEL readings were much above normal at 162% of average. The Similkameen River Basin snow surveys reported the lowest readings at 75% of average. The Olympic Peninsula reported the highest snowpack readings at 243% of average. Westside averages from SNOTEL, combined with April 1 snow survey data, showed the North Puget Sound river basins with 159% of average, the Central Puget river basins with 155%, and the Cowlitz - Lewis river basins with 198% of average. Snowpack along the east slopes of the Cascade Mountains included the Yakima area with 156% and the Wenatchee area with 167%. Snowpack in the Spokane River Basin was at 131% and the Lower Snake River Basin, had 127% of average. Maximum snow cover in Washington was at Cayuse Pass snow course near Mount Rainer, with water content of 133.7 inches. This site would normally have 82.4 inches of water content on April 1. Last year at this time Cayuse Pass had 77.3 inches of snow water equivalent. The highest average in the state was Spirit Lake SNOTEL near Mount St. Helens with 697% of average.

BASIN	PERCENT OF LAST YEAR	PERCENT OF AVERAGE
Spokane	181	131
Newman Lake	191	165
Pend Oreille	157	114
Okanogan	132	148
Methow	133	117
Similkameen	99	75
Wenatchee	165	158
Chelan	153	164
Stemilt Creek	147	164
Yakima	165	168
Ahtanum Creek	153	165
Walla Walla	193	145
Lower Snake	163	127
Cowlitz	179	174
Lewis	197	222
White	150	170
Green	152	114
Puyallup	153	170
Cedar	143	143
Snoqualmie	167	155
Skykomish	163	155
Skagit	202	182
Baker	121	115
Nooksack	231	182
Olympic Peninsula	248	243

Precipitation

During the month of March, the National Weather Service and Natural Resources Conservation Service climate stations showed a considerable variation in precipitation accumulation across Washington. The highest percent of average mountain precipitation in the state was at Miner's Ridge SNOTEL in the Central Cascade Mountains. Miner's Ridge reported 258% of average for a total of 17.8 inches. The average for this site is 6.9 inches for March. Basin averages for the water-year varied from 158% of average in the Olympic Peninsula river basins to 116% of average in the Walla Walla river basins. The highest individual site average for the water-year was 253% of average at Thunder Basin SNOTEL site in the North Cascade Mountains.

RIVER BASIN	MARCH PERCENT OF AVERAGE	WATER YEAR PERCENT OF AVERAGE
Spokane	100	126
Colville-Pend Oreille	95	128
Okanogan-Methow	132	146
Wenatchee-Chelan	127	148
Upper Yakima	68	137
Lower Yakima	95	142
Walla Walla	88	116
Lower Snake	74	119
Cowlitz-Lewis	97	145
White-Green-Puyallup	94	131
Central Puget Sound	74	140
North Puget Sound	114	142
Olympic Peninsula	159	158

Reservoir

Reservoir storage in the Yakima Basin was 473,300-acre feet, or 81% of average for the upper reaches and 132,900-acre feet, 87% of average for Rimrock and Bumping Lakes. Storage at the Okanogan reservoirs was 127% of average for April 1. The power generation reservoirs included the following: Coeur d'Alene Lake, 236,500-acre feet, or 139% of average and 99% of capacity; Chelan Lake, 179,900-acre feet, 85% of average and 27% of capacity; and Ross Lake at 201% of average and 43% of capacity.

BASIN	PERCENT OF CAPACITY	PERCENT OF AVERAGE
Spokane	99	139
Colville-Pend Oreille	47	128
Okanogan-Methow	81	127
Wenatchee-Chelan	27	85
Upper Yakima	57	81
Lower Yakima	57	87
Five Yakima Reservoirs	57	82
North Puget Sound	43	201

Streamflow

April 1 forecasts indicate above normal summer flows for all streams in the state. They vary from 195% of average for the Colville River at Kettle Falls to 110% of average for the White and Green rivers. April forecasts for some Western Washington streams include: Cedar River near Cedar Falls, 128%; Lewis River, 143%; and the Skagit River, 136%. Some Eastern Washington streams include the Yakima River near Parker, 142%; the Wenatchee River at Peshastin, 143%; and the Spokane River near Post Falls, 136%. Volumetric forecasts are developed using current, historic, and average snowpack and precipitation and streamflow data collected and coordinated by organizations cooperating with NRCS.

Streamflows reported for March varied from well above to well below average. The South Fork Walla Walla River near Milton Freewater had the highest flows with 257% of average. The Similkameen River at Nighthawk with only 49% of average had the lowest in the state. Other streamflows were the following percentage of average: the Priest River, 162%; the Columbia at the International Boundary, 126%; the Spokane at Spokane, 131%; the Columbia below Rock Island Dam, 128%; the Cle Elum River near Roslyn, 63%; and the Snake River below Ice Harbor Dam, 172%. Variable streamflows can be attributed to varying snowmelt and regulated or non-regulated characteristics of each stream.

BASIN	PERCENT OF AVERAGE MOST PROBABLE FORECAST (50 PERCENT CHANCE OF EXCEEDENCE)
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Spokane	136-138
Colville-Pend Oreille	114-195
Okanogan-Methow	138-188
Wenatchee-Chelan	132-148
Upper Yakima	134-138
Lower Yakima	125-185
Walla Walla	123-162
Lower Snake	120-123
Cowlitz-Lewis	132-185
White-Green-Puyallup	110
Central Puget Sound	113-130
North Puget Sound	128-136
Olympic Peninsula	137-144

STREAM	PERCENT OF AVERAGE MARCH STREAMFLOWS
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Pend Oreille Below Box Canyon	114
Kettle at Laurier	195
Columbia at Birchbank	126
Spokane at Long Lake	140
Similkameen at Nighthawk	49
Okanogan at Tonasket	145
Methow at Pateros	95
Chelan at Chelan	99
Wenatchee at Pashastin	77
Yakima at Cle Elum	75
Yakima at Parker	91
Naches at Naches	89
Grande Ronde at Troy	179
Snake below Lower Granite Dam	148
SF Walla Walla near Milton Freewater	257
Cowlitz below Mayfield Dam	117
Skagit at Concrete	120

For more information contact your local Natural Resources Conservation Service office.

BASIN SUMMARY OF SNOW COURSE DATA

APRIL 1999

SNOW COURSE	ELEVATION	DATE	SNOW DEPTH	WATER CONTENT	LAST YEAR	AVERAGE 1961-90	SNOW COURSE	ELEVATION	DATE	SNOW DEPTH	WATER CONTENT	LAST YEAR	AVERAGE 1961-90
ALPINE MEADOWS PILL	3500	4/01/99	---	71.2E	50.0	43.5	LONE PINE PILL	3800	4/01/99	---	84.5	39.5	32.1
AMBROSE	6480	3/25/99	43	17.4	9.4	13.2	LOOKOUT PILL	5140	4/01/99	---	45.7	25.3	33.4
ASHLEY DIVIDE	4820	3/23/99	16	5.7	3.2	6.6	LOST HORSE	5940	4/01/99	92	37.4	17.6	32.3
BADGER PASS	6900	3/26/99	102	46.0	---	38.4	LOST HORSE MTN CAN.	5850	3/29/99	37	11.7	7.6	9.3
BADGER PASS PILL	6900	4/01/99	---	44.8	22.9	36.5	LOST HORSE PILL	5000	4/01/99	---	35.2	25.8	26.4
BAREE CREEK	5500	3/24/99	137	59.8	31.8	45.3	LOST LAKE PILL	6110	4/01/99	---	77.2	41.4	63.2
BAREE MIDWAY	4600	3/24/99	111	44.6	24.3	35.1	LOWER SANDS CREEK #2	3120	3/30/99	75	26.0	18.1	19.6
BAREE TRAIL	3800	3/24/99	37	14.1	6.0	8.4	LUBRECHT FOREST NO 3	5450	3/31/99	17	4.9	2.8	6.8
BARKER LAKES PILL	8250	4/01/99	---	16.2	12.1	15.4	LUBRECHT FOREST NO 4	4650	3/31/99	3	1.0	0	2.1
BASIN CREEK PILL	7180	4/01/99	---	9.0	9.7	8.7	LUBRECHT FOREST NO 6	4040	3/31/99	4	1.2	0	2.3
BASSOO PEAK	5150	3/29/99	29	9.8	5.0	11.3	LUBRECHT HYDROPL	4200	3/31/99	16	5.0	0	4.2
BERNE-MILL CREEK (d)	3170	3/31/99	118	45.3	24.9	27.2	LUBRECHT PILL	4680	4/01/99	---	3.3	2.8	5.1
BIG CREEK	6750	4/01/99	112	43.6	32.6	45.7	LYMAN LAKE PILL	5900	4/01/99	---	88.5	64.5	56.9
BLACK MOUNTAIN	7750	3/25/99	43	14.0	15.8	16.3	LYNN LAKE	4000	4/02/99	70	17.3	18.0	22.0
BLACK PINE PILL	7100	4/01/99	---	15.3	8.2	12.7	MARIAS PASS	5250	3/30/99	53	20.7	11.4	17.4
BLEWETT PASS #2	4270	3/29/99	56	23.9	16.4	15.1	MARTEN LAKE AM	3600	4/01/99	264	118.5	70.0	73.4
BLEWETT PASS#2PILL	4270	4/01/99	---	18.8	13.4	17.8	MEADOWS PASS PILL	3240	4/01/99	---	36.8	20.9	24.9
BLUE LAKE	5900	4/05/99	75	30.0	11.8	25.3	MERRITT	2140	3/31/99	57	23.3	6.7	12.8
BRIEF	1600	3/31/99	13	5.6	2.0	2.5	MICA CREEK PILL	4750	4/01/99	---	36.6	18.3	---
BRUSH CREEK TIMBER	5000	3/30/99	23	7.0	3.1	9.5	MINERAL CREEK	4000	3/30/99	56	22.5	15.5	17.5
BULL MOUNTAIN	6600	3/31/99	17	6.8	2.9	6.4	MISSION RIDGE	5000	3/29/99	71	28.1	18.7	16.5
BUMPING LAKE (NEW)	3400	3/30/99	92	31.3	16.6	18.3	MOOSE CREEK PILL	6200	4/01/99	---	21.8	13.2	18.0
BUMPING RIDGE PILL	4600	4/01/99	---	56.3	29.4	21.2	MORSE LAKE PILL	5400	4/01/99	---	91.1	67.4	47.2
BUNCHGRASS MDWPILL	5000	4/01/99	---	47.8	30.2	26.6	MOSES MTN PILL	4800	4/01/99	---	35.5	17.1	15.5
BUTTE CREEK	4070	3/31/99	26	7.8	8.2	9.0	MOSQUITO RDG PILL	5200	4/01/99	---	51.3	27.5	37.3
CAYUSE PASS	5300	3/23/99	304	133.0	77.3	82.4	MOUTON RESERVOIR	6850	4/01/99	15	6.4	5.5	6.8
CEDAR GROVE	3760	3/31/99	45	17.3	5.9	12.2	MOUNT CRAG PILL	4050	4/01/99	---	77.5E	39.0	31.5
CHESSMAN RESERVOIR	6200	3/30/99	6	1.4	1.5	3.9	MOUNT GARDNER PILL	2860	4/01/99	---	26.7	13.3	14.0
CHICKEN CREEK	4060	3/29/99	53	19.6	10.7	14.0	MUTTON CREEK #1	5700	3/31/99	75	28.1	17.6	13.2
CHIAWAUKUM G.S.	2500	3/31/99	54	18.1	7.8	8.9	N.F. ELK CR PILL	6250	4/01/99	---	13.5	9.0	13.2
COLOCUM PASS	5370	3/30/99	69	26.2	18.7	16.5	NEVADA CREEK PILL	6480	4/01/99	---	19.1	10.0	13.4
COMBINATION PILL	5600	4/01/99	---	4.4	3.0	5.8	NEZ PERCE CMP PILL	5650	4/01/99	---	16.9	11.0	15.1
COPPER BOTTOM PILL	5200	4/01/99	---	14.3	5.7	11.7	NEZ PERCE PASS	6570	4/01/99	---	18.0E	13.2	19.2
COPPER CAMP	6950	3/28/99	94	39.1	16.2	29.9	NOISY BASIN PILL	6040	4/01/99	---	45.4	36.0	40.7
COPPER CREEK	5700	3/28/99	45	14.5	6.4	14.2	NORTH FORK JOCKO	6330	4/01/99	118	48.1	31.7	44.9
COPPER MOUNTAIN	7700	3/25/99	34	10.6	10.0	11.4	OLALLIE MDWS PILL	3960	4/01/99	---	86.6	55.6	53.5
CORNER CREEK	3150	3/29/99	36	11.7	6.8	6.1	OPHIR PARK	7150	3/28/99	45	16.8	11.6	18.0
CORRAL PASS PILL	6000	4/01/99	---	51.0	35.4	32.6	PALLISADE CREEK	8250	3/29/99	86	37.1	26.4	29.9
COTTONWOOD CREEK	6400	3/25/99	27	8.0	7.7	8.8	PARADISE PARK PILL	5500	4/01/99	---	99.2	66.3	---
COUGAR MTN. PILL	3200	4/01/99	---	26.8	14.0	18.8	PARK CK RIDGE PILL	4600	4/01/99	---	72.1	44.8	---
COYOTE HILL	4200	3/30/99	30	10.2	6.3	9.5	PETERSON MDW PILL	7200	4/01/99	---	11.4	9.9	---
DALY CREEK PILL	5780	4/01/99	---	13.8	9.6	11.9	PIGTAIL PEAK PILL	5900	4/01/99	---	76.2	52.3	49.3
DESERT MOUNTAIN	5600	4/05/99	45	17.4	10.6	15.5	PIKE CREEK	5930	3/29/99	77	29.3	15.8	26.7
DISCOVERY BASIN	7050	3/31/99	33	9.6	10.2	11.3	PIKE CREEK PILL	5930	4/01/99	---	35.5	17.9	27.9
DIX HILL	6400	2/38/99	24	8.4	8.0	11.3	PIPESTONE PASS	7200	3/26/99	22	6.4	5.0	5.9
DOMMERIE FLATS	2200	4/01/99	11	4.7	0	4.3	POPE RIDGE PILL	3540	4/01/99	76	28.5	18.8	15.7
EAST FORK R.S.	5400	3/26/99	16	4.6	3.2	5.6	POTATO HILL PILL	4500	4/01/99	---	50.8	25.9	25.3
EAST RAGGED SADDLE	3740	4/01/99	67	28.1	19.5	20.4	QUARTZ PEAK PILL	4700	4/01/99	---	30.7	19.6	21.9
EL DORADO MINE	7800	3/29/99	57	20.5	19.4	21.6	ROUND TOP MTN	4020	3/31/99	45	17.0	9.9	---
ELBOW LAKE PILL	3200	4/01/99	159	73.1	28.4	32.0	RAGGED RIDGE	3330	3/31/99	31	11.0	2.3	3.5
EMERY CREEK	4350	3/25/99	43	17.8	11.9	15.7	RAINY PASS PILL	4780	4/01/99	---	61.7	32.9	38.0
EMERY CREEK PILL	4350	4/01/99	---	16.1	10.1	16.3	REX RIVER PILL	1900	4/01/99	110	44.7	26.9	27.6
FATTY CREEK	5500	4/01/99	74	25.1	17.6	24.3	ROCKER PEAK PILL	8000	4/01/99	---	13.7	13.3	15.3
FISH CREEK	8000	3/25/99	34	11.4	9.8	9.9	ROLAND SUMMIT	5120	3/25/99	117	54.1	28.0	37.3
FISH LAKE	3370	3/31/99	136	54.4	32.1	31.4	RUSTY CREEK	4000	3/31/99	29	8.5	6.6	5.9
FISH LAKE PILL	3370	4/01/99	---	55.0	28.4	31.9	SADDLE MTN PILL	7900	4/01/99	---	29.8	20.4	26.1
FLATTOP MTN PILL	6300	4/01/99	---	58.8	37.5	47.1	SAGE CREEK SADDLE	4080	3/29/99	67	25.0	15.1	17.8
FLEECER RIDGE	7500	3/31/99	34	13.2	7.3	11.3	SALMON MDWS PILL	4500	4/01/99	---	15.7	13.5	9.4
FRED BURR PASS	8000	3/29/99	68	25.2	22.8	25.4	SASSE RIDGE PILL	4200	4/01/99	---	57.9	37.7	32.1
FROHNER MDWS PILL	6480	4/01/99	---	7.2	6.5	8.7	SAVAGE PASS PILL	6170	4/01/99	---	35.7	20.0	27.2
GIBBONS PASS	7100	3/26/99	66	26.4	17.0	23.2	SAWMILL RIDGE	4700	4/02/99	95	38.0	31.6	36.3
GOAT CREEK	3600	3/31/99	20	5.2	5.6	4.3	SHEEP CANYON PILL	4050	4/01/99	---	77.9	34.4	39.8
GOLD CREEK LAKE	7200	2/39/99	43	17.4	11.6	15.9	SKALKAH PILL	7260	4/01/99	---	31.2	20.4	24.9
GRASS MOUNTAIN #2	2900	4/02/99	33	12.5	0	15.9	SKITWISH RIDGE	5110	3/30/99	109	44.9	27.6	31.2
GRAVE CREEK	4300	3/29/99	47	17.3	13.7	17.0	SKOOKUM CREEK PILL	3920	4/01/99	---	50.2	23.2	29.3
GRAVE CRK PILL	4300	4/01/99	---	16.8	12.8	16.7	SLIDE ROCK MOUNTAIN	7100	4/01/99	---	21.5E	11.2	16.7
GREEN LAKE PILL	6000	4/01/99	110	42.3	24.9	20.7	SPENCER MDW PILL	3400	4/01/99	---	73.2	38.3	29.6
GROUSE CAMP PILL	5380	4/01/99	---	34.2	20.1	19.8	SPIRIT LAKE PILL	3100	4/01/99	---	25.1	6	3.6
GUNSIGHT LAKE	6300	3/26/99	109	47.6	27.8	40.0	SPOTTED BEAR MTN.	7000	3/26/99	35	12.8	7.3	14.9
HAND CREEK PILL	5030	4/01/99	---	13.4	8.3	13.3	STAHL PEAK PILL	6030	4/01/99	---	43.7	33.1	35.1
HARTS PASS PILL	6500	4/01/99	---	69.7	41.2	41.3	STAMPEDE PASS PILL	3860	4/01/99	---	63.0	38.8	44.4
HEART LAKE TRAIL	4800	3/31/99	80	27.8	15.4	21.6	STEMILT SLIDE	5000	3/30/99	59	22.7	14.0	12.8
HELL ROARING DIVIDE	5770	3/31/99	91	33.8	21.2	31.0	STEMPLE PASS	6600	3/24/99	37	12.4	5.4	10.6
HERRIG JUNCTION	4850	3/29/99	87	34.2	20.7	26.0	STEVENS PASS PILL	4070	4/01/99	---	56.7	35.7	42.3
HIGH RIDGE PILL	4980	4/01/99	---	25.5	17.4	24.4	STEVENS PASS SAND SD	3700	3/31/99	129	53.1	27.0	33.7
HOLBROOK	4530	3/31/99	28	9.0	5.0	9.0	STRANGER MOUNTAIN	4230	3/29/99	59	19.3	13.9	12.2
HOODOO BASIN PILL	6050	4/01/99	---	61.4	30.8	47.0	SUMMIT G.S.	4600	3/31/99	31	10.6	8.8	8.1
HUMBOLDT GLCH PILL	4250	4/01/99	---	18.5	7.7	13.3	SUNSET PILL	5540	4/01/99	---	27.4	15.6	37.6
HURRICANE	4500	3/27/99	140	56.0	15.1	22.1	SURPRISE LKS PILL	4250	4/01/99	---	84.2	53.8	44.2
INTERGAARD	6450	3/26/99	23	7.2	7.1	8.6	TINKHAM CREEK PILL	3000	4/01/99	---	15.6	26.8	19.9
ISINTOK LAKE CAN.	5100	3/26/99	29	9.1	4.4	7.1	TOUCHET #2 PILL	5530	4/01/99	---	56.0	24.8	31.9
JUNE LAKE PILL	3200	4/01/99	---	74.3	28.7	36.3	TROUGH #2 PILL	5310	4/01/99	---	16.1	13.8	9.7
KISHENEHN	3890	3/27/99	25	8.1	6.6	7.0	TUNNEL AVENUE	2450	3/30/99	90	37.2	17.3	20.8
KRAFT CREEK PILL	4750	4/01/99	---	13.5	8.5	15.3	TWIN CAMP	4100	4/02/99	68	28.8	17.1	20.8
LESTER CREEK	3100	4/02/99	74	24.6	18.9	23.3	UPPER WHEELER PILL	4400	4/01/99	---	20.5	15.3	39.2
LOGAN CREEK	4300	3/30/99	25	6.3	3.8	7.1	WELLS CREEK PILL	4200	4/01/99	131	56.2	27.6	39.2
LOLO PASS PILL	5240	4/01/99	---	46.3	20.5	32.3	WHITE PASS ES PILL	4500	4/01/99	---	35.1	21.5	22.9



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Washington State
Snow, Water and Climate Services

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Helpful Internet Addresses

NRCS Snow Survey and Climate Services Homepages

Washington:
<http://www.wa.nrcs.usda.gov/nrcs/CoopSnoSrvy.htm>

Oregon:
<http://crystal.or.nrcs.usda.gov/snows-surveys>

Idaho:
<http://idsnow.id.nrcs.usda.gov>

National Water and Climate Center (NWCC):
<http://www.wcc.nrcs.usda.gov>

NWCC Anonymous FTP Server:
<ftp.wcc.nrcs.usda.gov>

USDA-NRCS Agency Homepages

Washington:
<http://www.wa.nrcs.usda.gov/nrcs>

NRCS National:
<http://www.ftw.nrcs.usda.gov>



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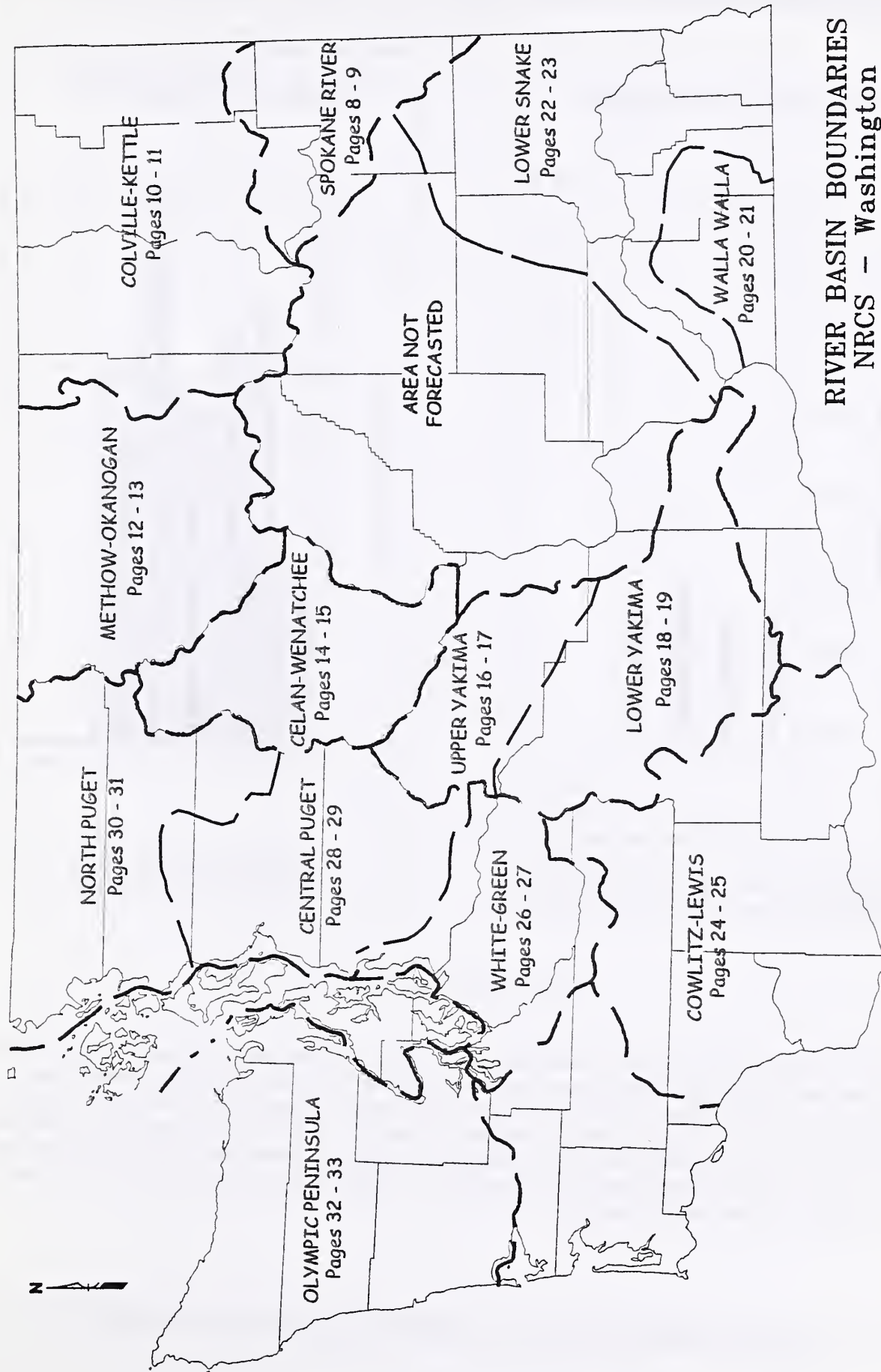
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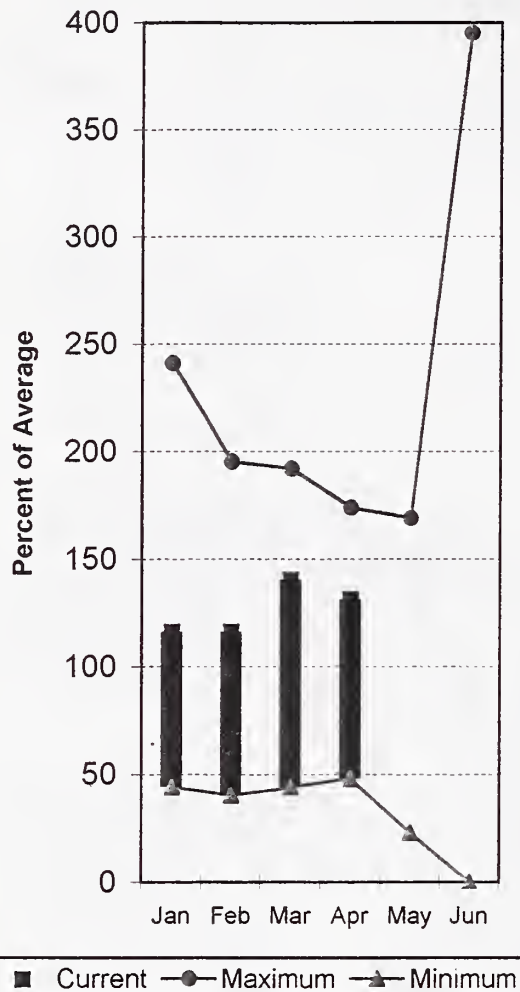
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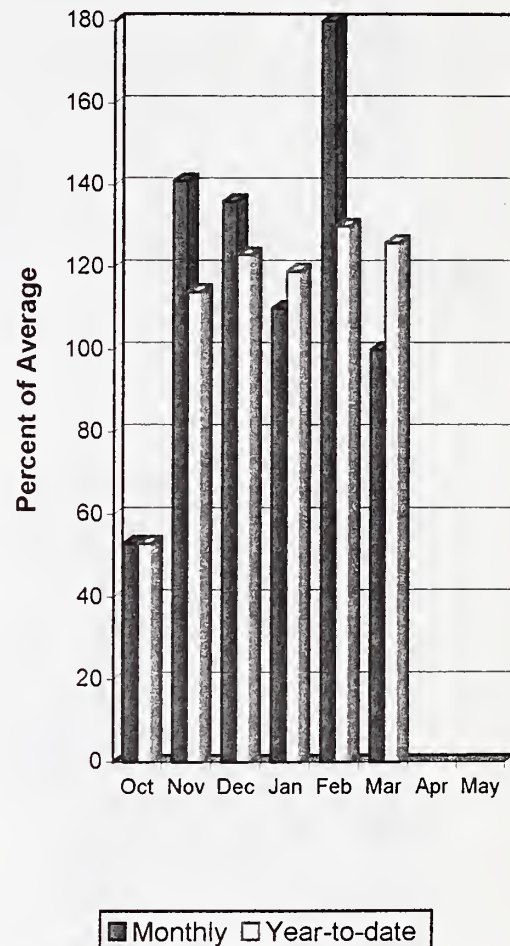
RIVER BASIN BOUNDARIES
NRCS - Washington
1999

Spokane River Basin

Mountain Snowpack*



Basin Precipitation*



*Based on selected stations

The April 1 forecasts for summer runoff within the Spokane River Basin are 136% of average near Post Falls and 138% of average at Long Lake. The forecasts are based on a basin snowpack that is 131% of average and precipitation that is 126% of average for the water-year. Precipitation for March was near normal. Streamflow for the Spokane River at Long Lake, was 140% of average for March. April 1 storage in Coeur d'Alene Lake, was 236,500-acre feet, 193% of average and 99% of capacity. Snowpack at Quartz Peak SNOTEL site contained 30.7 inches of water, compared to the average April 1 reading of 21.9 inches. Average temperatures in the Spokane Basin were about 2 degrees above normal.

For more information contact your local Natural Resources Conservation Service office.

Spokane River Basin

Streamflow Forecasts - April 1, 1999

SPOKANE near Post Falls (2)	APR-SEP	3258	3527		3710	136		3893	4162	2730
	APR-JUL	3139	3402		3580	136		3758	4021	2633
SPOKANE at Long Lake	APR-JUL	3573	3863		4060	138		4257	4547	2936
	APR-SEP	3815	4116		4320	137		4524	4825	3159

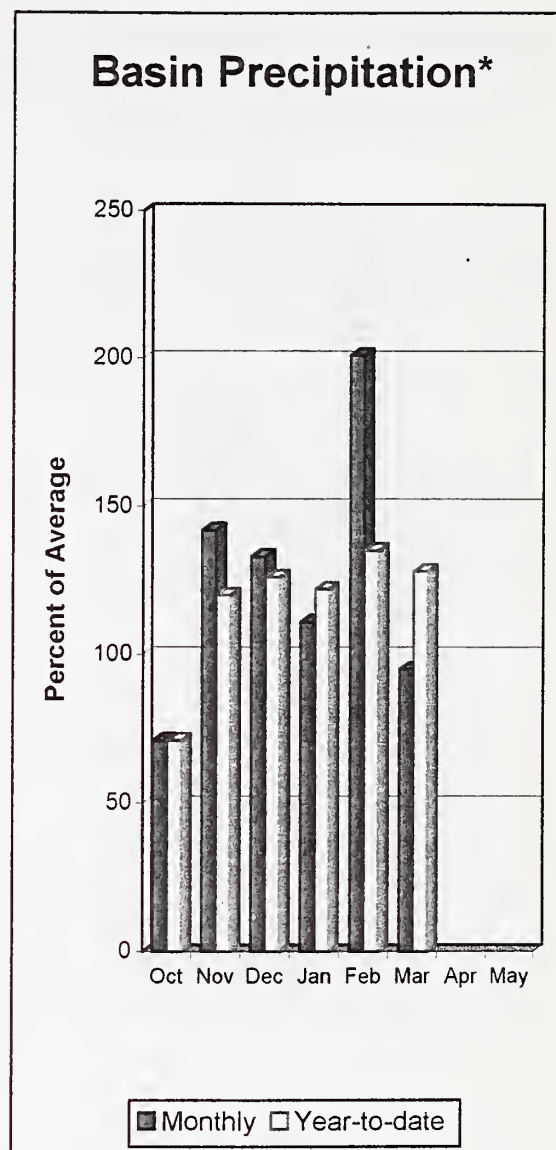
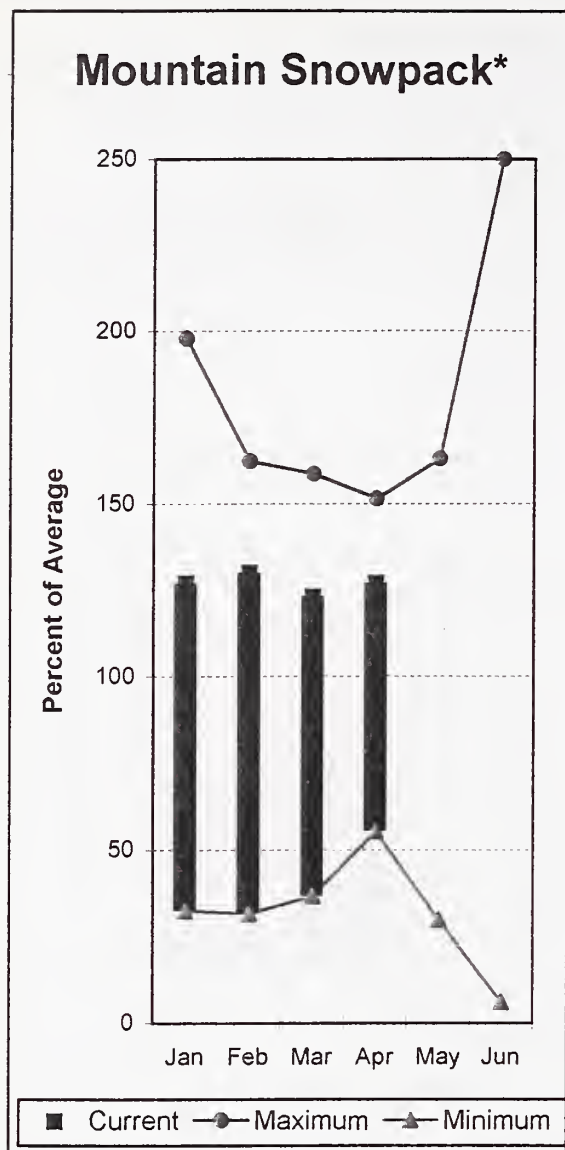
SPOKANE RIVER BASIN Reservoir Storage (1000 AF) - End of March					SPOKANE RIVER BASIN Watershed Snowpack Analysis - April 1, 1999			
Reservoir	Usable Capacity	*** This Year	Usable Storage Last Year	*** Avg	Watershed	Number of Data Sites	This Year as % of	
							Last Yr	Average
COEUR D'ALENE	238.5	236.5	190.5	170.1	SPOKANE RIVER	17	182	131
					NEWMAN LAKE	2	191	165

* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.

The average is computed for the 1961-1990 base period.

- (1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
 (2) - The value is natural flow - actual flow may be affected by upstream water management.

Colville - Pend Oreille River Basins



*Based on selected stations

The April - September forecast for the Kettle River streamflow is 125% of average; the Pend Oreille below Box Canyon, 114%; and the Priest River near the town of Priest River, 121% of average. March streamflow was 114% of average on the Pend Oreille River; 126% on the Columbia at the International Boundary; and 195% on the Kettle River. April 1 snow cover was 114% of average in the Pend Oreille Basin and 117% of average in the Kettle River Basin. Bunchgrass Meadows SNOTEL site recorded 47.8 inches of snow-water-equivalent on April 1. Average April 1 snowpack for Bunchgrass Meadows is 26.6 inches. Precipitation during March was 95% of average, bringing the year-to-date precipitation to 1128% of average. Reservoir storage in Roosevelt and Banks lakes was 47% of capacity and 128 % of average on April 1. Average temperatures were about 2 degrees above normal.

For more information contact your local Natural Resources Conservation Service office.

Colville - Pend Oreille River Basins

Streamflow Forecasts - April 1, 1999

Forecast Point	Forecast Period	<<===== Drier ===== Future Conditions ===== Wetter =====>>						
		Chance Of Exceeding *						
		90% (1000AF)	70% (1000AF)	50% (Most Probable) (1000AF)	(% AVG.)	30% (1000AF)	10% (1000AF)	30-Yr Avg. (1000AF)
PEND OREILLE Lake Inflow (1,2)	APR-JUL	12448	14272	15100	115	15928	17752	13150
	APR-SEP	13598	15594	16500	115	17406	19402	14370
	APR-JUN	10595	12318	13100	115	13882	15605	11390
PRIEST nr Priest River (1,2)	APR-JUL	778	920	985	121	1050	1192	814
	APR-SEP	829	981	1050	121	1119	1271	868
PEND OREILLE bl Box Canyon (1,2)	APR-JUL	12770	14441	15200	114	15959	17630	13380
	APR-SEP	13948	15772	16600	114	17428	19252	14590
	APR-JUN	11109	12547	13200	114	13853	15291	11570
COLVILLE at Kettle Falls	APR-SEP	220	241	256	195	271	292	131
	APR-JUL	204	224	237	198	250	270	120
	APR-JUN	190	207	219	197	231	248	111
KETTLE near Laurier	APR-SEP	2035	2205	2320	125	2435	2605	1854
	APR-JUL	1949	2099	2200	125	2301	2451	1761
	APR-JUN	1759	1890	1980	125	2070	2201	1585
COLUMBIA at Birchbank (1,2)	APR-JUL	36208	39091	40400	115	41709	44592	35140
	APR-SEP	45149	48760	50400	115	52040	55651	43810
	APR-JUN	26466	28552	29500	115	30448	32534	25670
COLUMBIA at Grand Coulee Dm (1,2)	APR-SEP	67252	73130	75800	117	78470	84348	64850
	APR-JUL	56632	61561	63800	117	66039	70968	54543
	APR-JUN	44415	48256	50000	117	51744	55585	42756

COLVILLE - PEND OREILLE RIVER BASINS Reservoir Storage (1000 AF) - End of March

Reservoir	Usable Capacity	*** Usable Storage ***		
		This Year	Last Year	Avg
ROOSEVELT		NO REPORT		
BANKS		NO REPORT		

COLVILLE - PEND OREILLE RIVER BASINS Watershed Snowpack Analysis - April 1, 1999

Watershed	Number of Data Sites	This Year as % of	
		Last Yr	Average
COLVILLE RIVER	2	162	161
PEND OREILLE RIVER	109	157	114
KETTLE RIVER	11	133	117

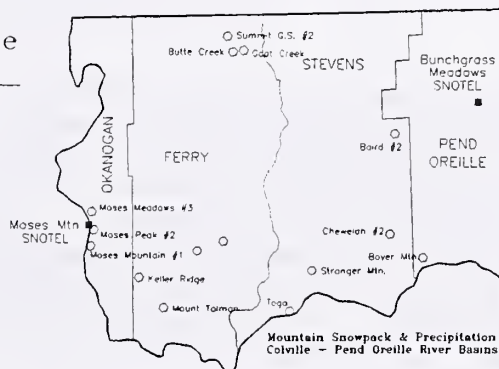
* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.

The average is computed for the 1961-1990 base period.

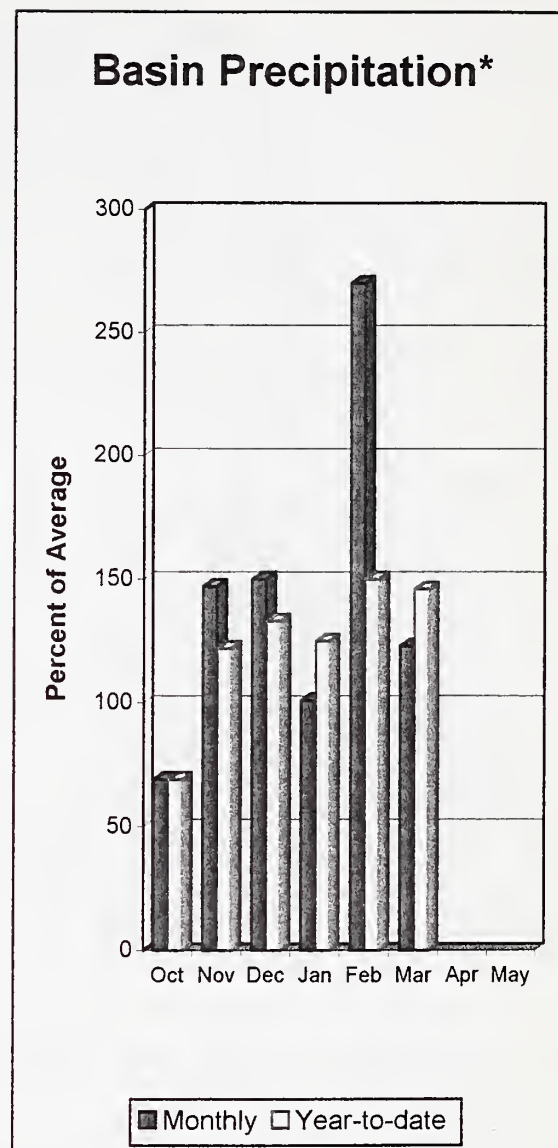
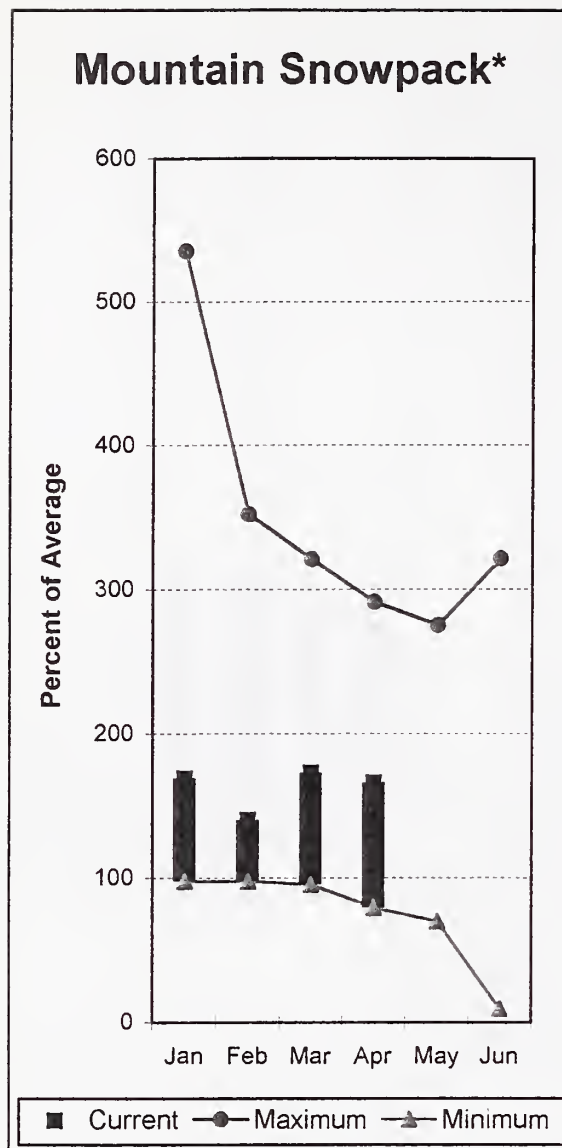
- (1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
 (2) - The value is natural flow - actual flow may be affected by upstream water management.

Percent of Average April 1, 1999

Snowpack - 130%
 Precipitation - 128%
 Reservoir - N/A



Okanogan - Methow River Basins



*Based on selected stations

Summer runoff forecast for the Okanogan River is 138% of average; the Similkameen River, 139%; the Methow River, 164%; and Salmon Creek, 188% of average. April 1 snow cover on the Okanogan was 148% of average; the Methow, 170%; and the Similkameen River, 75%. Harts Pass SNOTEL site had a April 1 reading of 69.7 inches or 169% of average. March precipitation in the Okanogan-Methow was 123% of average, with precipitation for the water-year at 146% of average. March streamflow for the Methow River was 95% of average; 145% for the Okanogan River; and 49% for the Similkameen. Snow-water-content at the Salmon Meadows SNOTEL, near Conconully, was 15.7 inches. Average for this site is 9.4 inches on April 1. Combined storage in the Conconully Reservoirs was 19,100-acre feet, which is 81% of capacity and 127% of the April 1 average. Temperatures were slightly above normal for the past month.

For more information contact your local Natural Resources Conservation Service office.

Okanogan - Methow River Basins

Streamflow Forecasts - April 1, 1999

		<<===== Drier ===== Future Conditions ===== Wetter =====>>							
Forecast Point	Forecast Period	Chance Of Exceeding *						30-Yr Avg. (1000AF)	
		90% (1000AF)	70% (1000AF)	50% (Most Probable) (1000AF) (% AVG.)		30% (1000AF)	10% (1000AF)		
SIMILKAMEEN near Nighthawk (1)	APR-JUL	1489	1710	1810	139	1910	2131	1304	
	APR-SEP	1603	1835	1940	139	2045	2277	1399	
	APR-JUN	1243	1454	1550	139	1646	1857	1113	
OKANOGAN near Tonasket (1)	APR-JUL	1463	1846	2020	138	2194	2577	1466	
	APR-SEP	1621	2047	2240	138	2433	2859	1623	
	APR-JUN	1248	1559	1700	138	1841	2152	1233	
SALMON CREEK near Conconully	APR-JUL	24	31	36	189	41	48	19.1	
	APR-SEP	25	33	38	188	43	50	20	
METHOW RIVER near Pateros	APR-SEP	1423	1492	1540	164	1588	1657	942	
	APR-JUL	1315	1378	1420	163	1462	1525	873	
	APR-JUN	1117	1175	1215	163	1255	1313	746	

OKANOGAN - METHOW RIVER BASINS Reservoir Storage (1000 AF) - End of March					OKANOGAN - METHOW RIVER BASINS Watershed Snowpack Analysis - April 1, 1999			
Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of	
		This Year	Last Year	Avg			Last Yr	Average
SALMON LAKE	10.5	7.4	8.9	8.0	OKANOGAN RIVER	24	132	148
CONCONULLY RESERVOIR	13.0	11.7	12.3	7.0	OMAK CREEK	1	208	229
					SANPOIL RIVER	0	0	0
					SIMILKAMEEN RIVER	5	99	75
					TOATS COULEE CREEK	1	0	133
					CONCONULLY LAKE	3	139	184
					METHOW RIVER	5	164	170

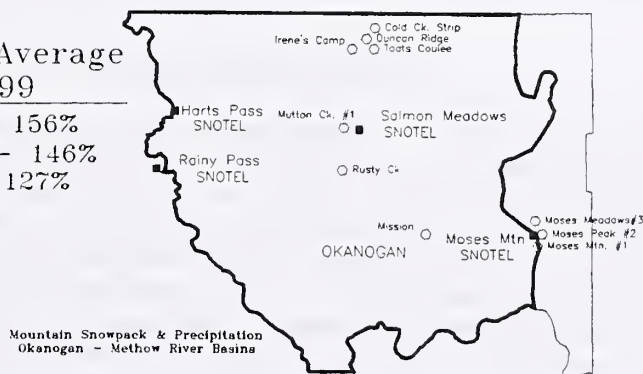
* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.

The average is computed for the 1961-1990 base period.

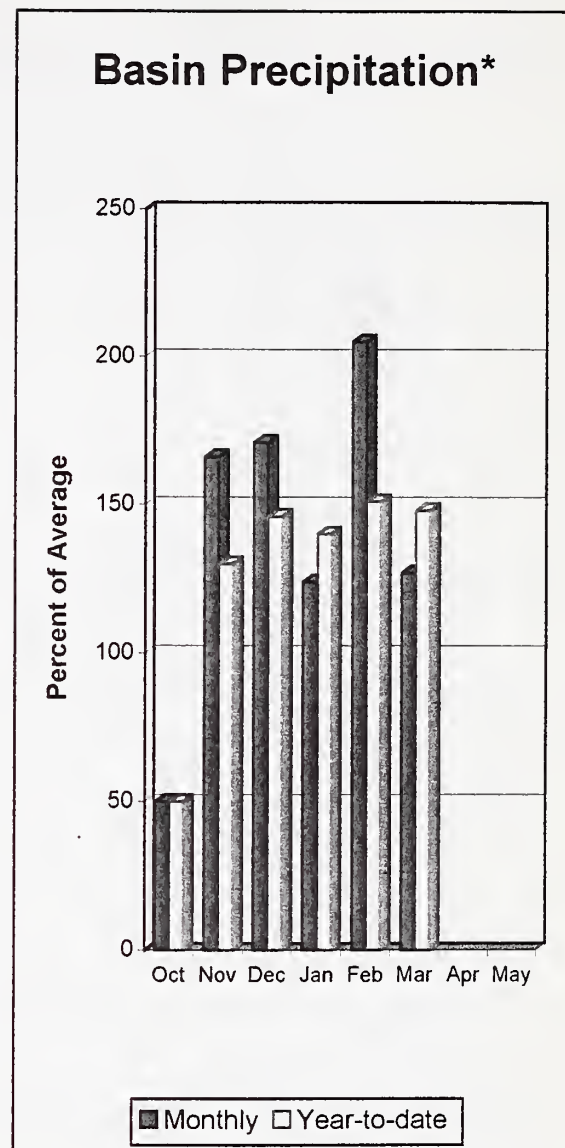
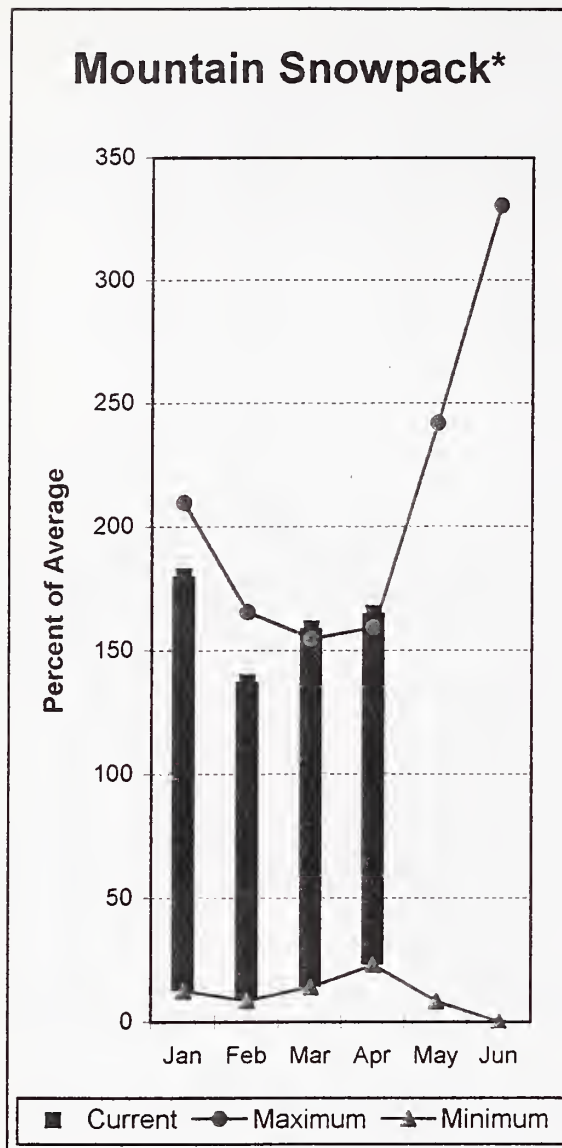
- (1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
 (2) - The value is natural flow - actual flow may be affected by upstream water management.

Percent of Average April 1, 1999

Snowpack - 156%
 Precipitation - 146%
 Reservoir - 127%



Wenatchee - Chelan River Basins



*Based on selected stations

Precipitation during March was 127% of average in the combined basin and 148% for the year-to-date. Runoff for the Entiat River is forecast to be 148% of average for the summer. The April-September forecast for the Chelan River is for 141% of average; it is 140% for the Wenatchee River at Plain; and for the Stehekin it is 140% of average. Icicle, Stemilt and Squilchuck creeks are all expected to be above average this summer. March streamflows on the Chelan River were 99% of average. The Wenatchee River averaged 77% of normal flows. April 1 snowpack in the Wenatchee Basin was 158% of average. The Chelan Basin was 164% of average; Colockum Ridge was 161%; and Stemilt Creek was 164% of average. Snowpack in the Entiat River Basin was 187% of average. Reservoir storage in Lake Chelan was 179,900-acre feet, or 85% of April 1 average and 27% of capacity. Lyman Lake SNOTEL had the most snow water equivalent with 88.5 inches of water. This site would normally have 56.9 inches on April 1. Temperatures were near normal for March.

For more information contact your local Natural Resources Conservation Service office.

Wenatchee - Chelan River Basins

Streamflow Forecasts - April 1, 1999

Forecast Point	Forecast Period	<<----- Drier -----		Future Conditions		----- Wetter ----->>		30-Yr Avg. (1000AF)
		=====		Chance Of Exceeding *		=====		
		90% (1000AF)	70% (1000AF)	50% (Most Probable) (1000AF)	(% AVG.)	30% (1000AF)	10% (1000AF)	
CHELAN RIVER near Chelan	APR-SEP	1504	1585	1640	141	1695	1776	1160
	APR-JUL	1339	1408	1455	142	1502	1571	1024
	APR-JUN	1019	1089	1137	140	1185	1255	912
STEHEKIN near STEHEKIN	APR-SEP	1064	1121	1160	140	1199	1256	827
	APR-JUL	893	939	970	138	1001	1047	701
	APR-JUN	672	719	750	139	781	828	538
ENTIAT RIVER near Ardenvoir	APR-SEP	311	326	336	148	346	361	227
	APR-JUL	280	294	304	148	314	328	206
	APR-JUN	223	237	246	146	255	269	169
WENATCHEE at Plain	APR-SEP	1527	1612	1670	140	1728	1813	1190
	APR-JUL	1396	1464	1510	141	1556	1624	1072
	APR-JUN	1128	1183	1220	141	1257	1312	864
WENATCHEE R. at Peshastin	APR-SEP	1824	2131	2340	143	2549	2856	1636
	APR-JUL	1674	1951	2140	144	2329	2606	1485
	APR-JUN	1360	1583	1735	144	1687	2110	1204
STEMILT nr Wenatchee (miners in)	MAY-SEP	138	164	182	132	200	226	138
ICICLE CREEK near Leavenworth	APR-SEP	436	459	474	138	489	512	344
	APR-JUL	407	425	438	138	451	469	318
	APR-JUN	326	346	360	137	374	394	263

WENATCHEE - CHELAN RIVER BASINS Reservoir Storage (1000 AF) - End of March

WENATCHEE - CHELAN RIVER BASINS Watershed Snowpack Analysis - April 1, 1999

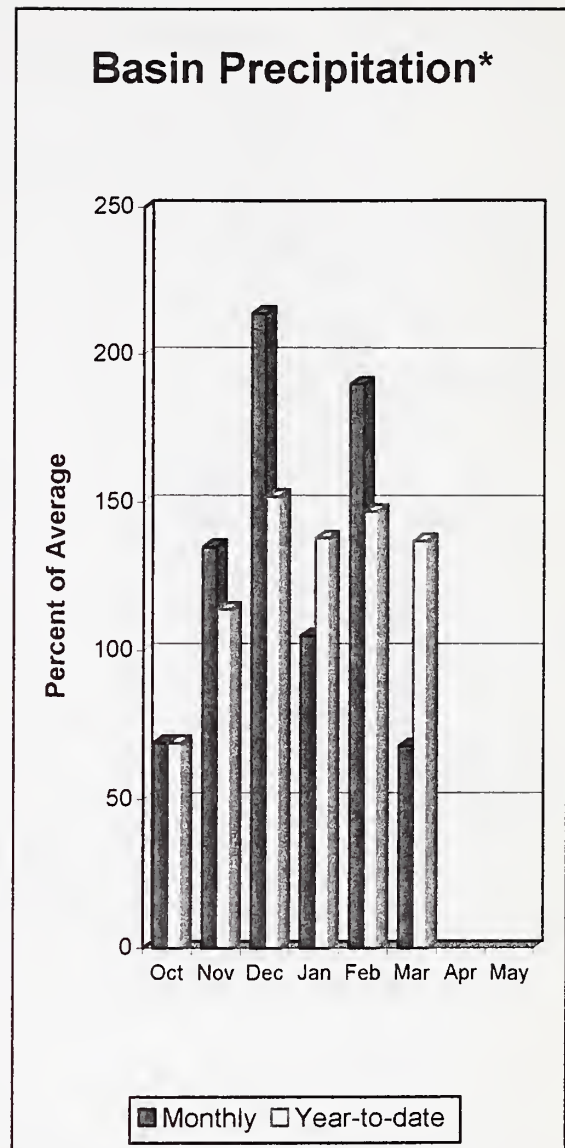
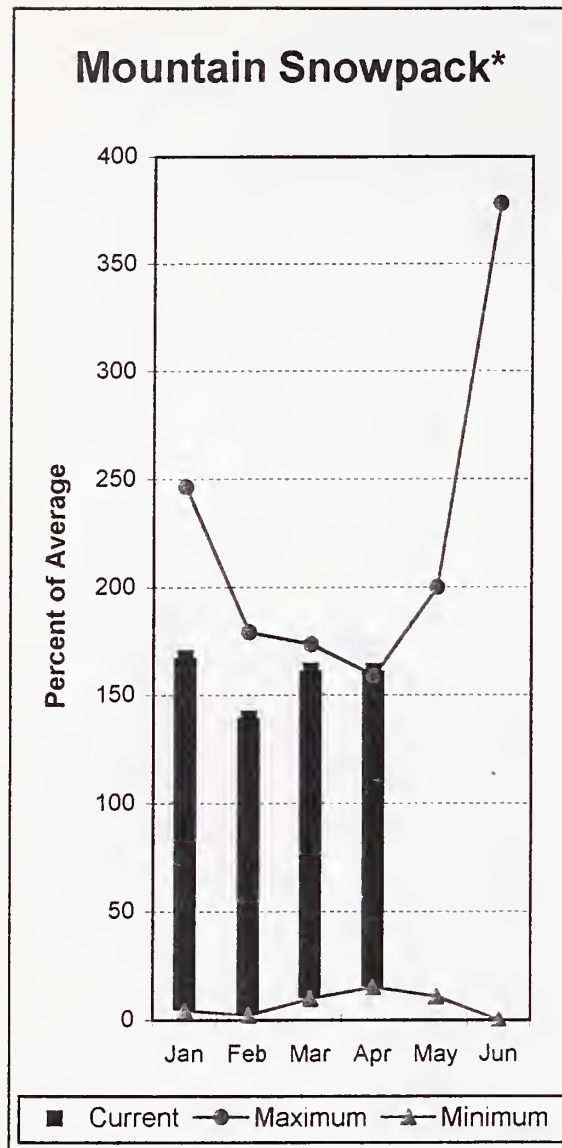
Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of	
		This Year	Last Year	Avg			Last Yr	Average
CHELAN LAKE	676.1	179.9	309.6	212.1	CHELAN LAKE BASIN	5	153	164
					ENTIAT RIVER	2	164	187
					WENATCHEE RIVER	13	165	158
					SQUILCHUCK CREEK	0	0	0
					STEMILT CREEK	2	147	164
					COLOCKUM CREEK	2	130	161

* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.

The average is computed for the 1961-1990 base period.

- (1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
- (2) - The value is natural flow - actual flow may be affected by upstream water management.

Upper Yakima River Basin



*Based on selected stations

April 1 reservoir storage for the Upper Yakima reservoirs was 473,300-acre feet, or 81% of average. Forecasts for the Yakima River at Cle Elum are for 134% of average. Lake inflows are all expected to be much above average this summer. March streamflows within the basin were: the Yakima near Cle Elum 75% and the Cle Elum River near Roslyn at 63%. April 1 snowpack was 156% based upon 12 snow courses and SNOTEL readings within the Upper Yakima Basin. Precipitation was only 68% of average for March and 137% for the water-year-to-date. Volume forecasts for the Yakima Basin are for natural flow. As such, they may differ from the U.S. Bureau of Reclamation's forecast for the total water supply available, which includes irrigation return flow.

For more information contact your local Natural Resources Conservation Service office.

Upper Yakima River Basin

Streamflow Forecasts - April 1, 1999

Forecast Point	Forecast Period	<<===== Drier ===== Future Conditions ===== Wetter =====>>						30-Yr Avg. (1000AF)
		Chance Of Exceeding *						
		90% (1000AF)	70% (1000AF)	50% (Most Probable) (1000AF)	(% AVG.)	30% (1000AF)	10% (1000AF)	
KEECHELUS LAKE INFLOW	APR-JUL	153	163	170	137	177	187	124
	APR-SEP	165	177	185	137	193	205	135
	APR-JUN	131	142	149	137	156	167	109
KACHESS LAKE INFLOW	APR-JUL	138	146	151	136	156	164	111
	APR-SEP	146	155	161	136	167	176	118
	APR-JUN	120	129	135	136	141	150	99
CLE ELUM LAKE INFLOW	APR-JUL	527	549	564	138	579	601	409
	APR-SEP	578	603	620	138	637	662	448
	APR-JUN	436	459	475	138	491	514	345
YAKIMA at Cle Elum	APR-JUN	897	943	975	135	1007	1053	721
	APR-JUL	1055	1097	1125	135	1153	1195	832
	APR-SEP	1151	1198	1230	134	1262	1309	915

UPPER YAKIMA RIVER BASIN Reservoir Storage (1000 AF) - End of March

UPPER YAKIMA RIVER BASIN Watershed Snowpack Analysis - April 1, 1999

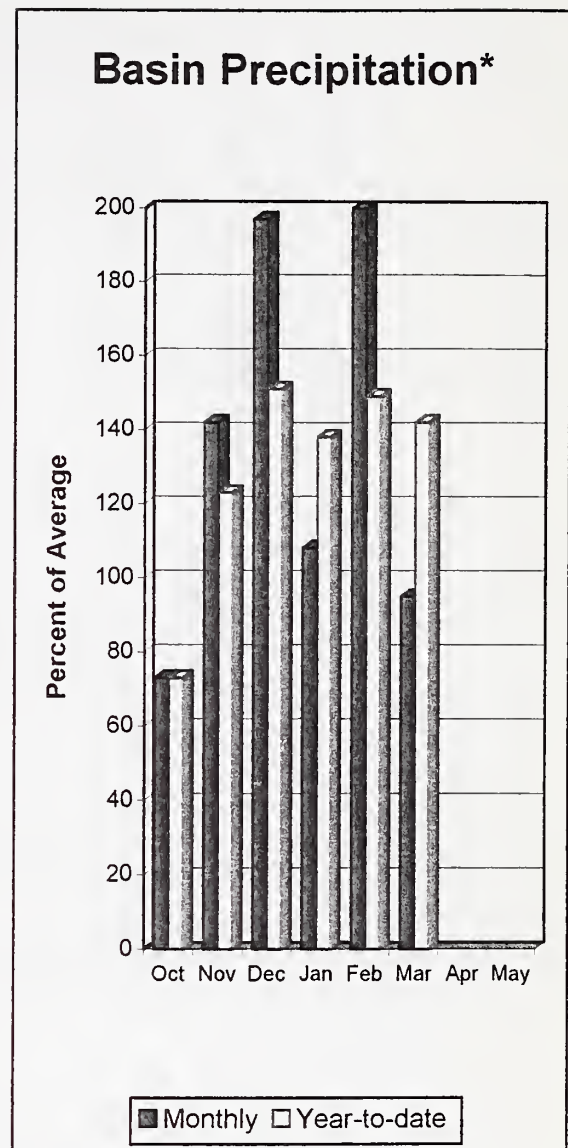
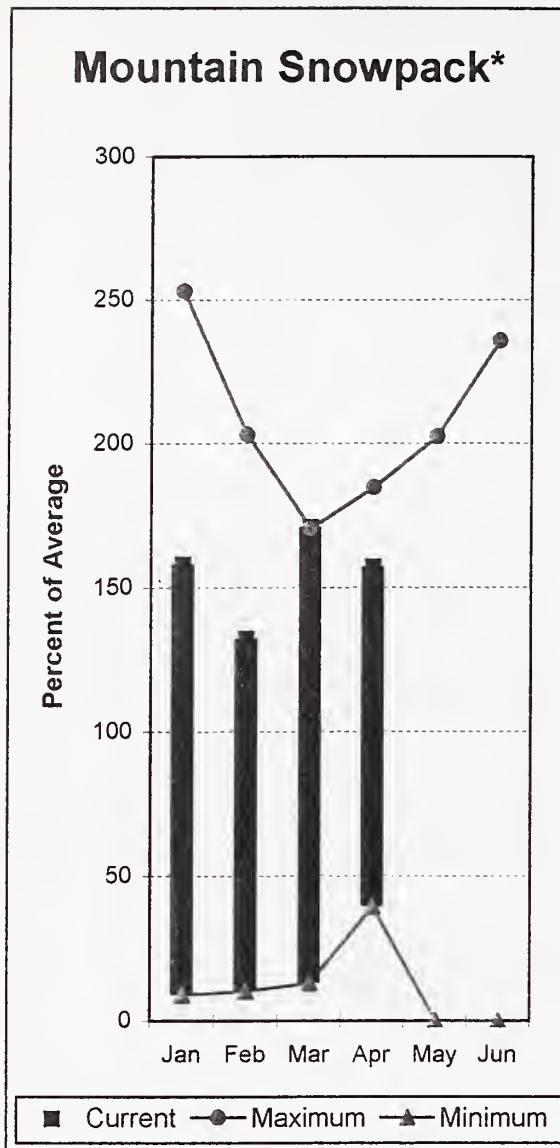
Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of	
		This Year	Last Year	Avg			Last Yr	Average
KEECHELUS	157.8	78.5	140.2	110.0	UPPER YAKIMA RIVER	12	168	156
KACHESS	239.0	171.7	193.3	187.0				
CLE ELUM	436.9	223.1	360.4	290.0				

, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.

The average is computed for the 1961-1990 base period.

- (1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
- (2) - The value is natural flow - actual flow may be affected by upstream water management.

Lower Yakima River Basin



*Based on selected stations

March streamflows within the basin were: the Yakima River near Parker, 91%; the Naches River near Naches, 89%; and the Yakima at Kiona, 115% of average. April 1 reservoir storage for the Bumping and Rimrock reservoirs was 132,900-acre feet, or 87% of average. Forecasts for the Yakima River at Parker are for 142% of average; American River near Nile, 125%; Ahtanum Creek, 130%; and the Klickitat River near Glenwood, 185%. April 1 snowpack was 180% based upon 7 snow courses and SNOTEL readings within the Lower Yakima Basin. Precipitation was 95% of average for March and 142% for the water-year-to-date. Volume forecasts for the Yakima Basin are for natural flow. As such, they may differ from the U.S. Bureau of Reclamation's forecast for the total water supply available, which includes irrigation return flow. Temperatures for the month were near normal.

For more information contact your local Natural Resources Conservation Service office.

Lower Yakima River Basin

Streamflow Forecasts - April 1, 1999

Forecast Point	Forecast Period	<<===== Drier =====		Future Conditions		===== Wetter =====>>		30-Yr Avg. (1000AF)
		Chance Of Exceeding *						
		90% (1000AF)	70% (1000AF)	50% (Most Probable) (1000AF)	(% AVG.)	30% (1000AF)	10% (1000AF)	
BUMPING LAKE INFLOW	APR-SEP	177	185	190	140	195	203	136
	APR-JUL	164	171	176	142	181	188	124
	APR-JUN	133	142	148	142	154	163	104
AMERICAN RIVER near Nile	APR-SEP	136	143	146	125	153	160	118
	APR-JUL	123	130	135	124	140	147	109
	APR-JUN	101	109	115	125	121	130	92
RIMROCK LAKE INFLOW	APR-SEP	280	295	305	128	315	330	238
	APR-JUL	238	249	257	129	265	276	200
	APR-JUN	184	197	206	127	215	228	162
NACHES near Naches	APR-SEP	1107	1150	1180	142	1210	1253	832
	APR-JUL	1009	1051	1080	143	1109	1151	755
	APR-JUN	852	899	930	143	961	1008	651
AHTANUM CREEK nr Tampico (2)	APR-SEP	43	53	60	130	67	77	46
	APR-JUL	40	49	55	131	61	70	42
	APR-JUN	34	42	47	131	52	60	36
YAKIMA near Parker	APR-SEP	2661	2762	2830	142	2898	2999	1994
	APR-JUL	2431	2520	2580	143	2640	2729	1805
	APR-JUN	2122	2216	2280	143	2344	2438	1597
KLICKITAT near Glenwood	APR-JUN	189	198	204	186	210	219	110
	APR-SEP	237	250	259	185	268	281	140

LOWER YAKIMA RIVER BASIN Reservoir Storage (1000 AF) - End of March					LOWER YAKIMA RIVER BASIN Watershed Snowpack Analysis - April 1, 1999			
Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of	
		This Year	Last Year	Avg			Last Yr	Average
BUMPING LAKE	33.7	6.9	12.4	11.0				
RIMROCK	198.0	126.0	154.5	142.0				

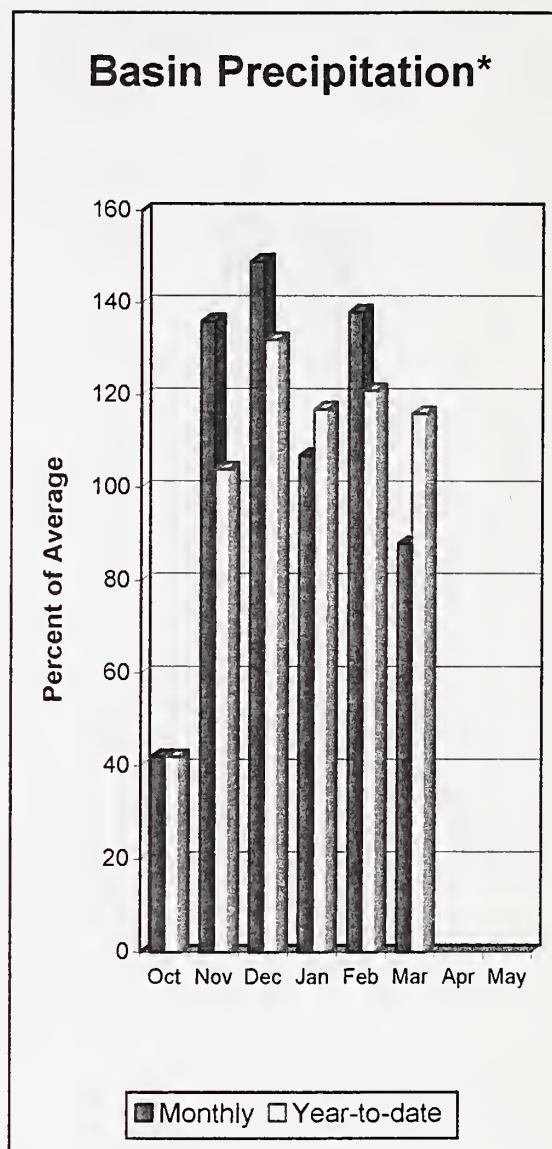
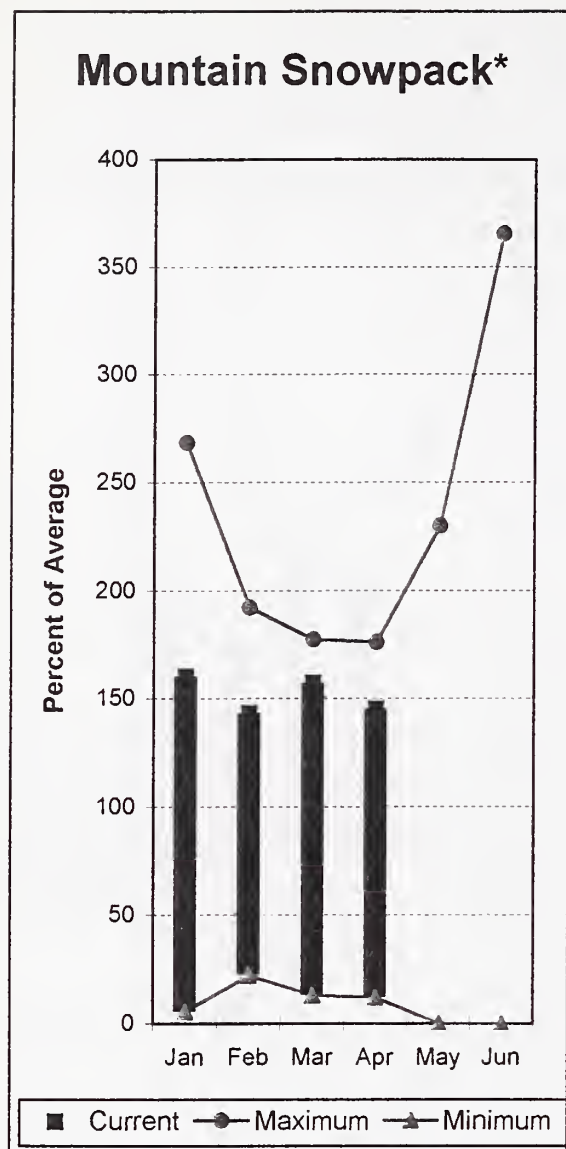
* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.

The average is computed for the 1961-1990 base period.

(1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.

(2) - The value is natural flow - actual flow may be affected by upstream water management.

Walla Walla River Basin



*Based on selected stations

March precipitation was 99% of average, bringing the year-to-date precipitation to 116% of average. April 1 snowpack was at 145% of average. The forecast is for 123% of average streamflow in the South Fork Walla Walla River and 162% for Mill Creek, during the coming summer. March streamflow was 257% of average for the Walla Walla River. The Touchet SNOTEL site had 56.0 inches of snow-water-equivalent. The average April 1 reading for this site is 31.9 inches. Average temperatures were near normal for the area.

For more information contact your local Natural Resources Conservation Service office.

Walla Walla River Basin

Streamflow Forecasts - April 1, 1999

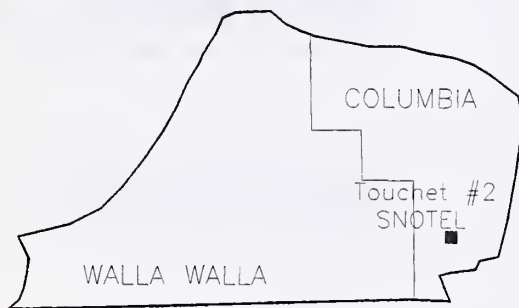
Forecast Point	Forecast Period	<<===== Drier =====		Future Conditions		===== Wetter =====>>		30-Yr Avg. (1000AF)
		90%	70%	50% (Most Probable)	Chance Of Exceeding *	30%	10%	
		(1000AF)	(1000AF)	(1000AF)	(% AVG.)	(1000AF)	(1000AF)	
MILL CREEK at Walla Walla	APR-SEP	22	25	28	162	30	34	17.1
	APR-JUL	21	25	27	162	30	33	16.9
	APR-JUN	21	25	27	162	29	33	16.7
SF WALLA WALLA near Milton-Freewater	APR-JUL	59	64	67	126	70	75	53
	APR-SEP	72	77	81	123	85	90	66

WALLA WALLA RIVER BASIN Reservoir Storage (1000 AF) - End of March					WALLA WALLA RIVER BASIN Watershed Snowpack Analysis - April 1, 1999			
Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of	
		This Year	Last Year	Avg			Last Yr	Average
					WALLA WALLA RIVER	2	193	145

* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.

The average is computed for the 1961-1990 base period.

- (1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
 (2) - The value is natural flow - actual flow may be affected by upstream water management.

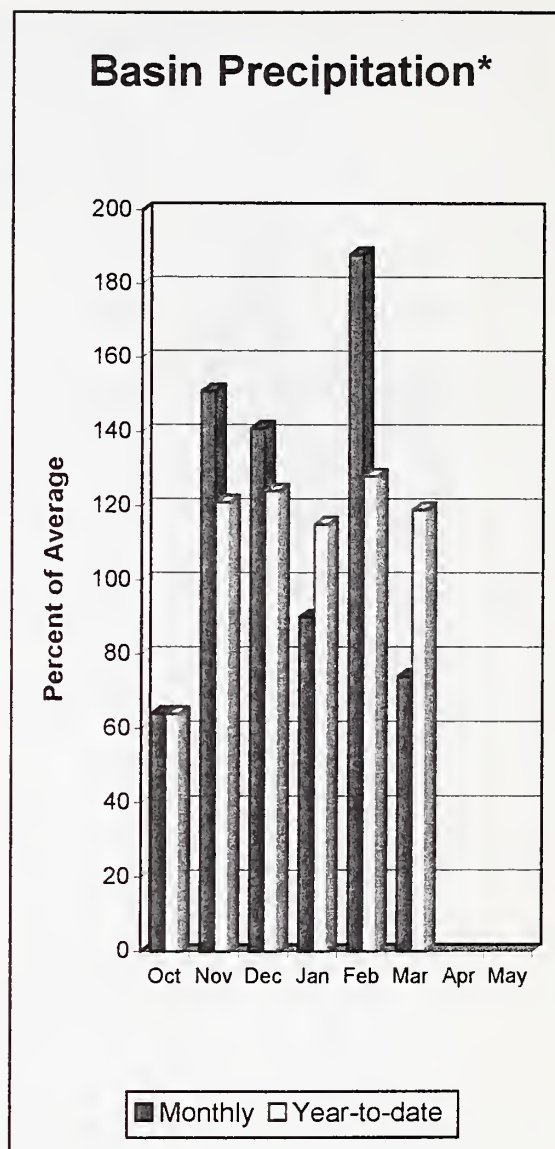
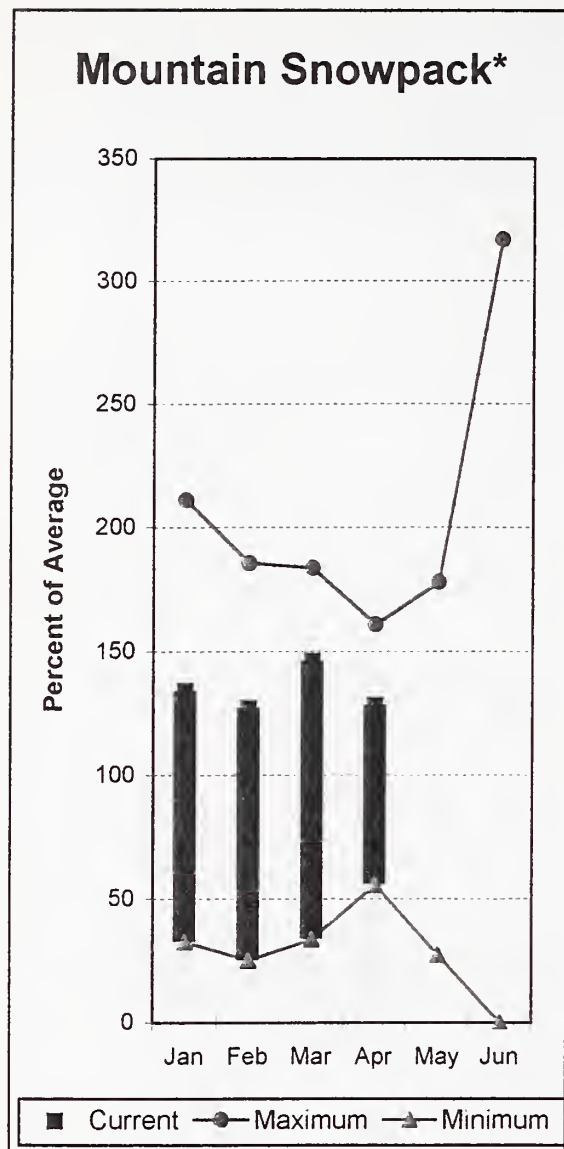


Mountain Snowpack & Precipitation
Walla Walla River Basin

Percent of Average April 1, 1999

Snowpack - 145%
Precipitation - 116%

Lower Snake River Basin



*Based on selected stations

The April - September forecast is for 120% of average streamflow in the Snake River below Lower Granite Dam; and the Clearwater River at Spalding, 123%. March precipitation was 74% of average, bringing the year-to-date precipitation to 119% of average. April 1 snowpack was at 127% of average. March streamflow was 138% of average for the Clearwater River; 148% for the Snake River below Lower Granite Dam; and 179% for the Grande Ronde River near Troy. Average temperatures were near normal for the area.

For more information contact your local Natural Resources Conservation Service office.

Lower Snake River Basin

Streamflow Forecasts - April 1, 1999

		<<==== Drier =====		Future Conditions =====		=====> Wetter =====>>		
Forecast Point	Forecast Period	=====		Chance Of Exceeding +		=====		30-Yr Avg. (1000AF)
		90% (1000AF)	70% (1000AF)	50% (Most Probable) (1000AF)	(% AVG.)	30% (1000AF)	10% (1000AF)	

CLEARWATER at Spalding (1,2)	APR-JUL	7552	8775	9330	123	9885	11108	7618
	APR-SEP	7988	9282	9870	123	10458	11752	8052

SNAKE blw Lower Granite Dam (1,2)	APR-JUL	21084	24465	26000	120	27535	30916	21650
	APR-SEP	23775	27574	29300	120	31026	34825	24360

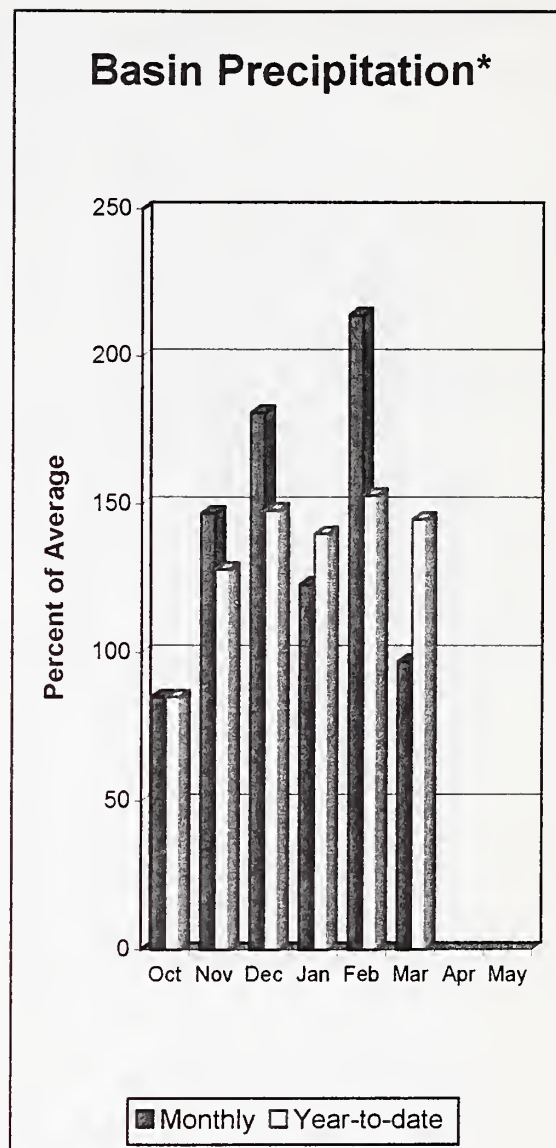
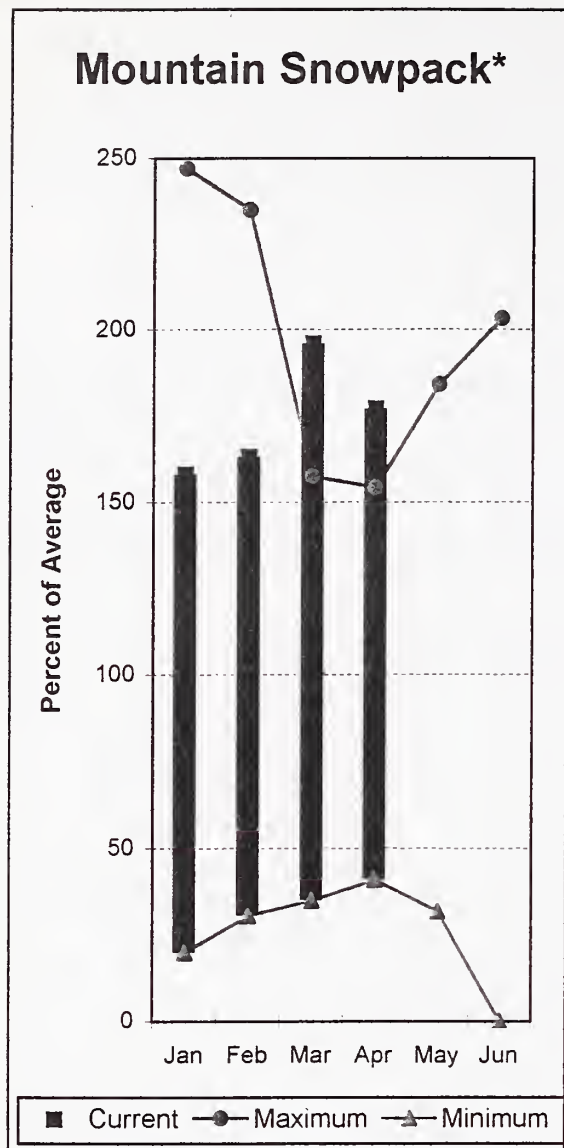
LOWER SNAKE RIVER BASIN					LOWER SNAKE RIVER BASIN			
Reservoir Storage (1000 AF) - End of March					Watershed Snowpack Analysis - April 1, 1999			
Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of	
		This Year	Last Year	Avg			Last Yr	Average
					LOWER SNAKE, GRANDE RONDE	16	163	127

* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.

The average is computed for the 1961-1990 base period.

- (1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
 (2) - The value is natural flow - actual flow may be affected by upstream water management.

Cowlitz - Lewis River Basins



*Based on selected stations

The forecast for summer runoff in the Lewis River Basin is 143% of average. The forecast for the Cowlitz River at Castle Rock is for 132%, and the Klickitat River near Glenwood is 185% of average runoff. March streamflow for the Cowlitz River was 117% of average and 109% for the Lewis River. March precipitation was 97% of average, 145% of average for the water-year. April 1 snow cover for the Cowlitz River was 174%, and the Lewis River was 222% of average. Average snowpack for the combined Cowlitz - Lewis river basins was 198% of average, exceeding the previous maximum by 33%. The Cayuse Pass snow course recorded the most water content for the basin with 133.7 inches of water. Average April 1 water content at Cayuse pass is 82.4 inches. Average temperatures were near normal during March.

For more information contact your local Natural Resources Conservation Service office.

Cowlitz - Lewis River Basins

Streamflow Forecasts - April 1, 1999

Forecast Point	Forecast Period	<<===== Drier =====		Future Conditions		===== Wetter =====>>		30-Yr Avg (1000AF)
		Chance Of Exceeding *						
		90% (1000AF)	70% (1000AF)	50% (Most Probable) (1000AF)	(% AVG.)	30% (1000AF)	10% (1000AF)	
LEWIS at Ariel (2)	APR-JUL	1228	1393	1505	143	1617	1782	1053
	APR-SEP	1436	1605	1720	143	1835	2004	1206
	APR-JUN	1094	1249	1355	145	1461	1616	935
COWLITZ R. bl Mayfield Dam (2)	APR-SEP	1821	2291	2610	133	2929	3399	1970
	APR-JUL	1601	2011	2290	132	2569	2979	1731
	APR-JUN	1360	1712	1950	132	2188	2540	1477
COWLITZ R. at Castle Rock (2)	APR-SEP	2550	3122	3510	132	3898	4470	2667
	APR-JUL	2223	2721	3060	132	3399	3897	2325
	APR-JUN	1915	2344	2635	132	2926	3355	1995
KLICKITAT near Glenwood	APR-JUN	189	198	204	186	210	219	110
	APR-SEP	237	250	259	185	268	281	140

COWLITZ - LEWIS RIVER BASINS Reservoir Storage (1000 AF) - End of March

COWLITZ - LEWIS RIVER BASINS Watershed Snowpack Analysis - April 1, 1999

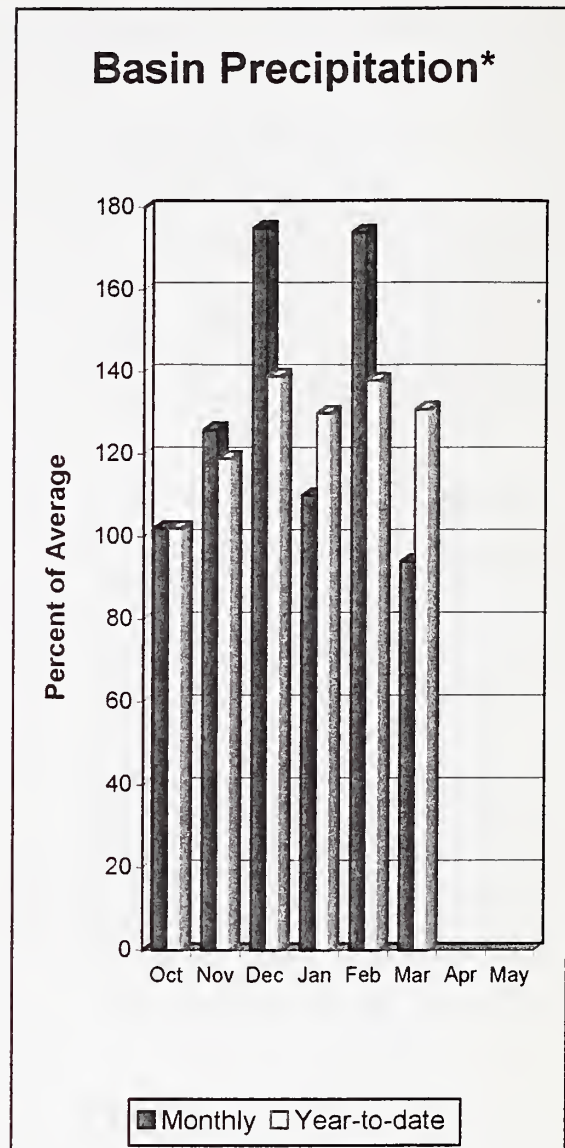
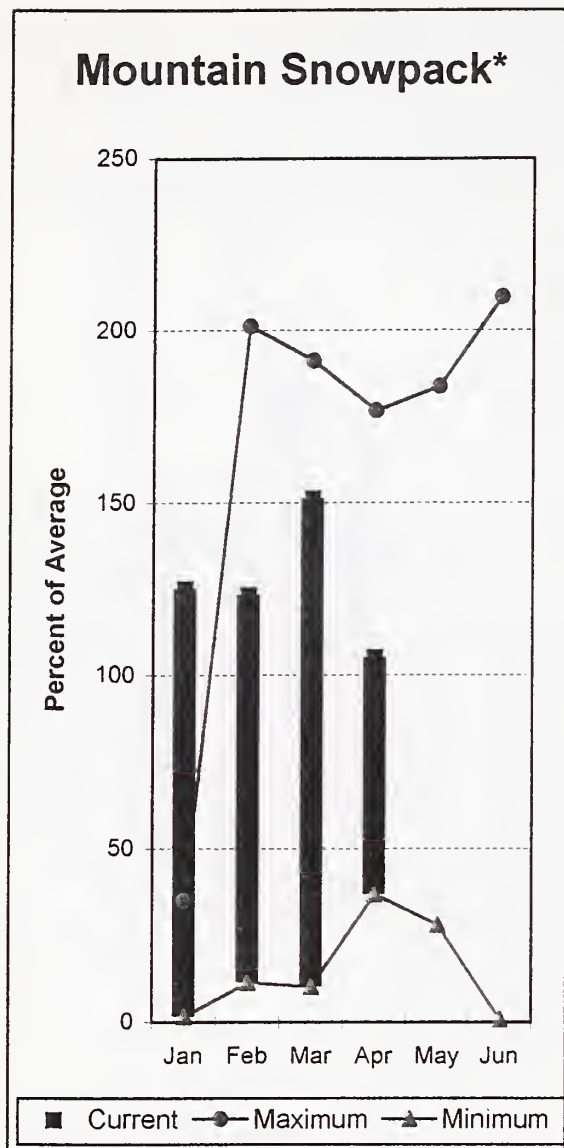
Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of	
		This Year	Last Year	Avg			Last Yr	Average
					LEWIS RIVER	4	197	222
					COWLITZ RIVER	7	179	174

* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.

The average is computed for the 1961-1990 base period.

- (1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
 (2) - The value is natural flow - actual flow may be affected by upstream water management.

White - Green River Basins



*Based on selected stations

Summer runoff is forecast to be 110% of average for the Green River and 110% of average for the White River near Buckley. April 1 snowpack was 170% of average in the White and Puyallup river basins; and 114% in the Green River Basin. Water content on April 1 at the Corral Pass SNOTEL, at an elevation of 6,000 feet, was 51 inches. This site has an April 1 average of 32.6 inches. March precipitation was 94% of average, bringing the water-year-to-date to 131% of average for the basins. Average temperatures in the area were near normal.

For more information contact your local Natural Resources Conservation Service office.

White - Green - Puyallup River Basins

Streamflow Forecasts - April 1, 1999

Forecast Point	Forecast Period	<<===== Drier =====		Future Conditions		===== Wetter =====>>		30-Yr Avg. (1000AF)
		90%	70%	50% (Most Probable)		30%	10%	
		(1000AF)	(1000AF)	(1000AF) (% AVG.)		(1000AF)	(1000AF)	
WHITE near Buckley (1,2)	APR-JUL	416	468	492	110	516	568	447
	APR-SEP	508	569	596	110	623	684	542
GREEN below Howard Hanson (1,2)	APR-JUL	237	270	285	111	300	333	257
	APR-SEP	261	298	314	110	330	367	285
	APR-JUN	219	247	260	111	273	301	234

WHITE - GREEN - PUYALLUP RIVER BASINS
Reservoir Storage (1000 AF) - End of March

WHITE - GREEN - PUYALLUP RIVER BASINS
Watershed Snowpack Analysis - April 1, 1999

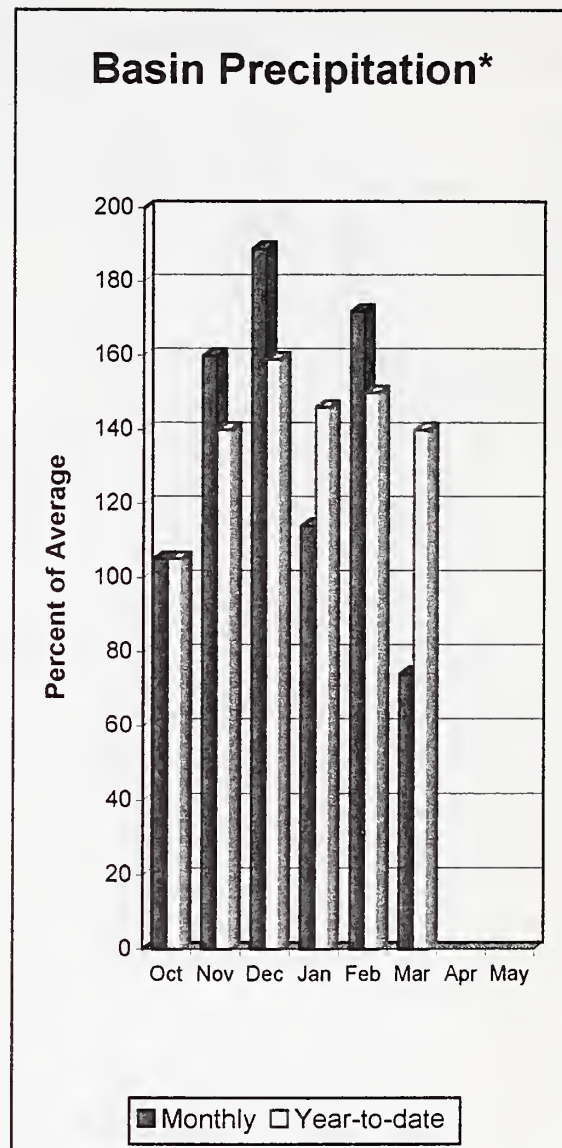
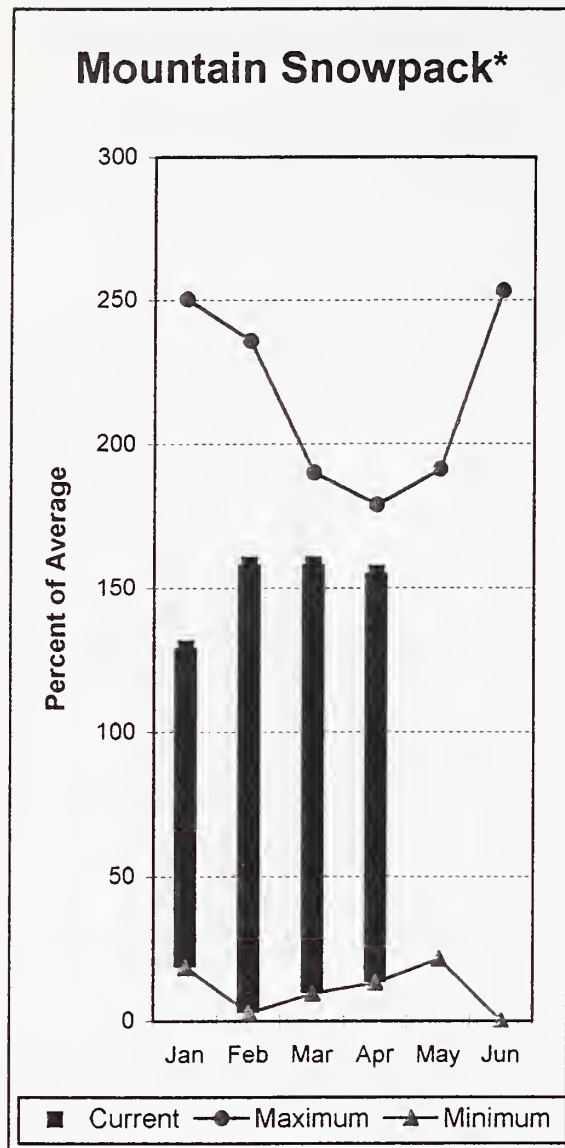
Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of	
		This Year	Last Year	Avg			Last Yr	Average
					WHITE RIVER	3	153	170
					GREEN RIVER	7	152	114
					PUYALLUP RIVER	3	153	170

* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.

The average is computed for the 1961-1990 base period.

- (1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
 (2) - The value is natural flow - actual flow may be affected by upstream water management.

Central Puget Sound River Basins



*Based on selected stations

Forecast for spring and summer flows are 128% for the Cedar River near Cedar Falls; 127% for the Rex River; 113% for the South Fork of the Tolt River; and 130% for the Cedar River at Cedar Falls. Basin-wide precipitation for March was 74% of average, bringing water-year-to-date to 140% of average. April 1 snow cover in the Cedar River Basin was 143%; the Tolt River Basin was 166%; the Snoqualmie River Basin was 155%; and the Skykomish River Basin was 155% of average. Stevens Pass SNOTEL, at 4,070 feet, had 56.7 inches of water content. Average April 1 water content is 42.3 inches. March temperatures were slightly below normal.

For more information contact your local Natural Resources Conservation Service office.

Central Puget Sound River Basins

Streamflow Forecasts - April 1, 1999

Forecast Point	Forecast Period	<<===== Drier =====		Future Conditions		===== Wetter =====>>		30-Yr Avg. (1000AF)
		Chance Of Exceeding *						
		90% (1000AF)	70% (1000AF)	50% (Most Probable) (1000AF)	(% AVG.)	30% (1000AF)	10% (1000AF)	
CEDAR near Cedar Falls	APR-JUL	84	92	98	128	104	112	77
	APR-SEP	93	102	108	128	114	124	84
	APR-JUN	75	82	87	128	92	99	68
REX near Cedar Falls	APR-JUL	28	32	35	127	37	41	27
	APR-SEP	31	36	39	127	42	46	30
	APR-JUN	25	29	31	127	34	37	25
CEDAR RIVER at Cedar Falls	APR-JUL	86	98	107	131	116	128	82
	APR-SEP	89	100	108	130	116	127	83
	APR-JUN	83	96	104	130	113	125	80
SOUTH FORK TOLT near Index	APR-JUL	14.9	16.3	17.3	114	18.3	19.7	15.2
	APR-SEP	17.0	18.9	20	113	21	23	17.8
	APR-JUN	12.3	13.9	14.9	114	15.9	17.5	13.1

CENTRAL PUGET SOUND RIVER BASINS Reservoir Storage (1000 AF) - End of March

CENTRAL PUGET SOUND RIVER BASINS Watershed Snowpack Analysis - April 1, 1999

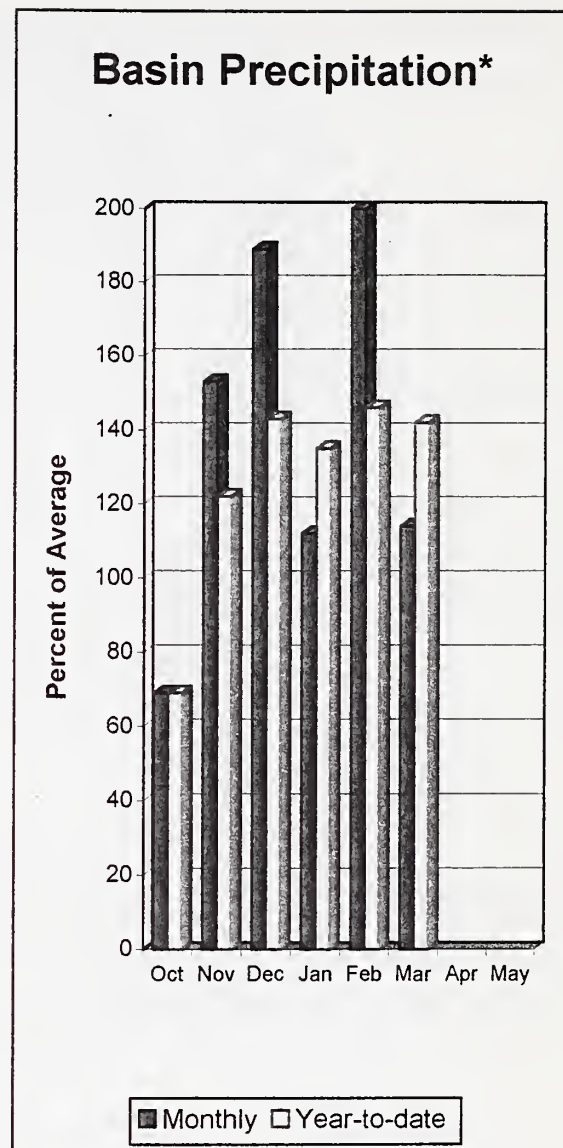
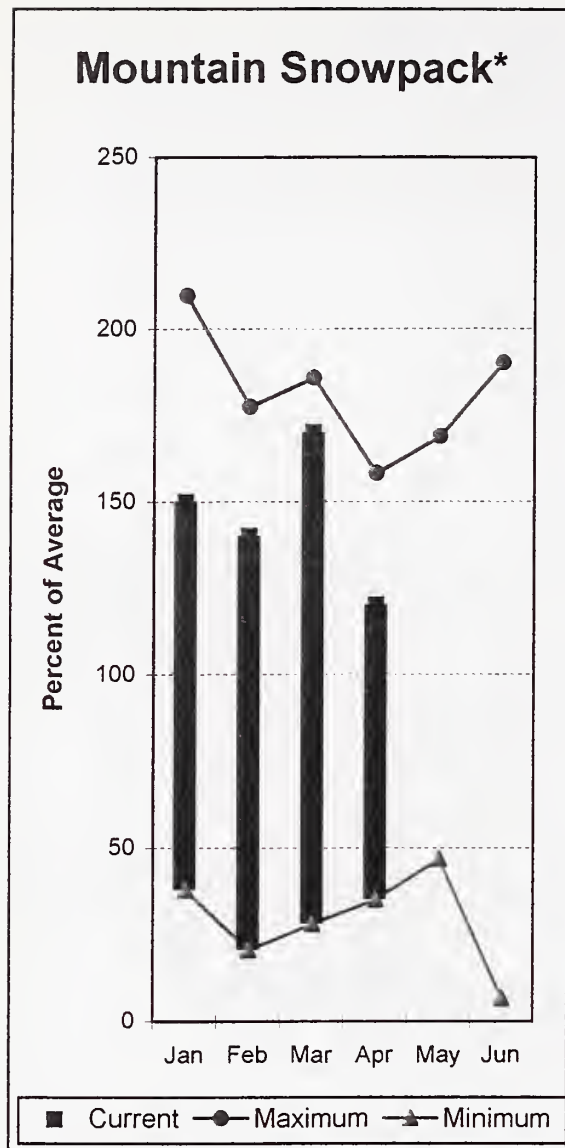
Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of	
		This Year	Last Year	Avg			Last Yr	Average
					CEDAR RIVER	5	143	143
					TOLT RIVER	3	167	166
					SNOQUALMIE RIVER	6	167	155
					SKYKOMISH RIVER	4	163	155

* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.

The average is computed for the 1961-1990 base period.

- (1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
- (2) - The value is natural flow - actual flow may be affected by upstream water management.

North Puget Sound River Basins



*Based on selected stations

Forecast for the Skagit River streamflow is for 136% of average for the spring and summer period. March streamflow in the Skagit River was 120% of average. Other forecast points included the Baker River at 133%, and Thunder Creek at 128% of average. Basin-wide precipitation for March was 114% of average, bringing water-year-to-date to 142% of average. April 1 snow cover in the Skagit River Basin was 182%, the Baker River Basin was 115%, and the Nooksack River Basin was 182% of average. Rainy Pass SNOTEL, at 4,780 feet, had 61.7 inches of water content. Average April 1 water content is 38.0 inches. Elbow Lake and Wells Creek SNOTEL sites continue set new record snowpack levels for the Nooksack River Basin. April 1 Skagit River reservoir storage was 201% average and 43% of capacity. Average March temperatures were near normal for the basin.

For more information contact your local Natural Resources Conservation Service office.

North Puget Sound River Basins

Streamflow Forecasts - April 1, 1999

		<<===== Drier ===== Future Conditions ===== Wetter =====>>						
Forecast Point	Forecast Period	Chance Of Exceeding						30-Yr Avg.
		90%	70%	50% (Most Probable)	30%	10%		
		(1000AF)	(1000AF)	(1000AF) (% AVG.)	(1000AF)	(1000AF)		

THUNDER CREEK near Newhalem	APR-JUL	267	283	294	128	305	321	230
	APR-SEP	391	408	420	128	432	449	328
	APR-JUN	157	177	190	128	203	223	149

SKAGIT at Newhalem (2)	APR-JUL	2407	2512	2583	138	2654	2759	1679
	APR-SEP	2770	2895	2980	136	3065	3190	2191
	APR-JUN	1815	1919	1990	137	2061	2165	1455

BAKER RIVER near Concrete	APR-JUL	1011	1070	1111	133	1152	1211	836
	APR-SEP	1292	1365	1415	133	1465	1538	1064
	APR-JUN	711	771	812	133	853	913	611

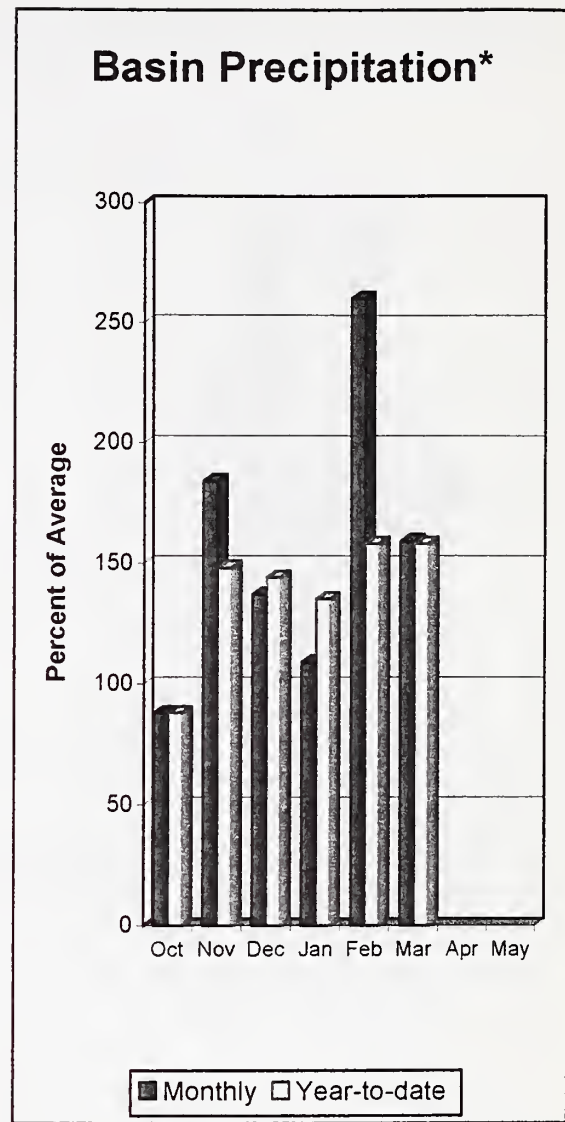
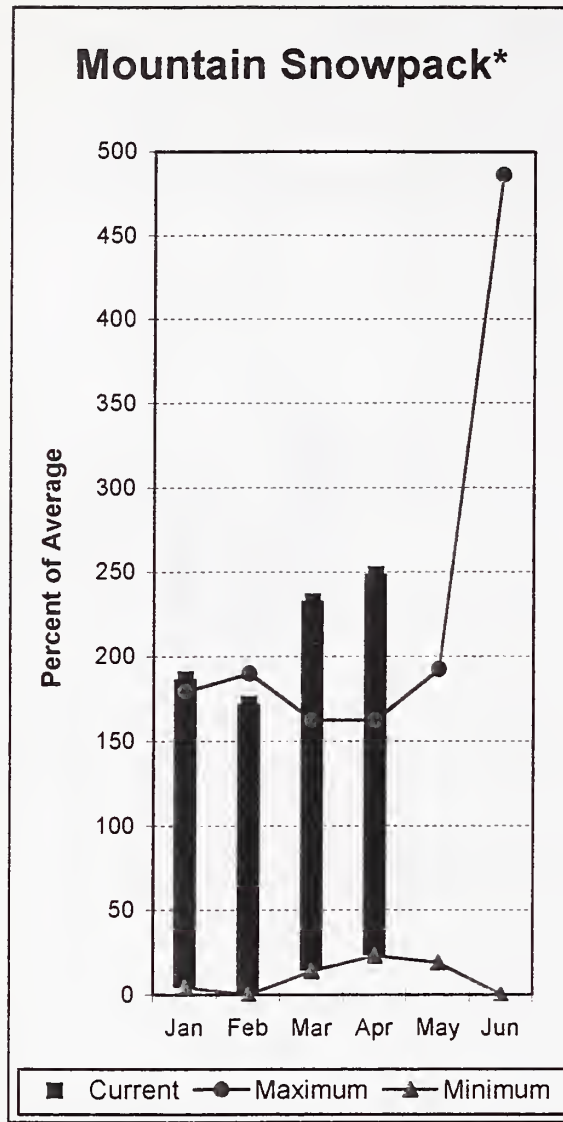
NORTH PUGET SOUND RIVER BASINS					NORTH PUGET SOUND RIVER BASINS			
Reservoir Storage (1000 AF) - End of March					Watershed Snowpack Analysis - April 1, 1999			
Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of	
		This Year	Last Year	Avg			Last Yr	Average
ROSS	1404.1	599.3	701.1	298.0	SKAGIT RIVER	13	202	182
DIABLO RESERVOIR	90.6	88.5	87.6	---	BAKER RIVER	3	166	156
GORGE RESERVOIR		NO REPORT			NOOKSACK RIVER	2	231	182

* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.

The average is computed for the 1961-1990 base period.

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 (2) The value is natural flow - actual flow may be affected by upstream water management.

Olympic Peninsula River Basins



*Based on selected stations

April forecasts for summer runoff for streamflow in the Dungeness River Basin are 137% of average and 144% of average for the Elwha River. The Big Quilcene and Wynoochee rivers can expect much above average runoff this summer also. March precipitation was 159% of average. Precipitation has accumulated at 158% of average for the water-year. March precipitation at Quillayute was 14.8 inches. The thirty-year average for March is 11.05 inches. April 1 snow cover in the Olympic Basin was a record breaking 243% of average. The Mount Crag SNOTEL near Quilcene had 77.5 inches of snow-water-equivalent on April 1. Average for this site is 31.5 inches. The Hurricane snow course was measured to have 56 inches of water content and 140 inches of snow depth. Average April 1 water content at Hurricane is only 22.1 inches. Temperatures were 1-2 degrees below average for the month.

For more information contact your local Natural Resources Conservation Service office.

Olympic Peninsula River Basins

Streamflow Forecasts - April 1, 1999

		<<===== Drier =====		Future Conditions		===== Wetter =====>>		
Forecast Point	Forecast Period	=====		Chance Of Exceeding *		=====		30-Yr Avg. (1000AF)
		90%	70%	50% (Most Probable)		30%	10%	
		(1000AF)	(1000AF)	(1000AF)	(% AVG.)	(1000AF)	(1000AF)	
DUNGENESS near Sequim	APR-SEP	192	203	210	137	217	228	153
	APR-JUL	156	165	171	137	177	186	125
	APR-JUN	114	123	129	137	135	144	94
ELWHA near Port Angeles	APR-SEP	674	710	735	144	760	796	510
	APR-JUL	557	589	610	144	631	663	424

OLYMPIC PENINSULA RIVER BASINS					OLYMPIC PENINSULA RIVER BASINS			
Reservoir Storage (1000 AF) - End of March					Watershed Snowpack Analysis - April 1, 1999			
Reservoir	Usable Capacity	*** Usable Storage ***			Watershed	Number of Data Sites	This Year as % of	
		This Year	Last Year	Avg			Last Yr	Average
					OLYMPIC PENINSULA	4	248	243
					ELWHA RIVER	1	371	253
					MORSE CREEK	1	240	243
					DUNGENESS RIVER	1	274	230
					QUILCENE RIVER	1	199	246
					WYNOOCHEE RIVER	0	0	0

* 90%, 70%, 30%, and 10% chances of exceeding are the probabilities that the actual flow will exceed the volumes in the table.

The average is computed for the 1961-1990 base period.

- (1) - The values listed under the 10% and 90% Chance of Exceeding are actually 5% and 95% exceedance levels.
 (2) - The value is natural flow - actual flow may be affected by upstream water management.



Natural Resources Conservation Service

SNOTEL Data Collection Network Fact Sheet

Introduction

The Natural Resources Conservation Service (NRCS) installs, operates, and maintains an extensive, automated system to collect snowpack and related climatic data in the Western United States called SNOTEL (for SNOwpack TELemetry). The system evolved from NRCS's Congressional mandate in the mid-1930's "to measure snowpack in the mountains of the West and forecast the water supply." The programs began with manual measurements of snow courses; since 1980, SNOTEL has reliably and efficiently collected the data needed to produce water supply forecasts and to support the resource management activities of NRCS and others.

Climate studies, air and water quality investigations, and resource management concerns are all served by the modern SNOTEL network. The high-elevation watershed locations and the broad coverage of the network provide important data collection opportunities to researchers, water managers, and emergency managers for natural disasters such as floods.

Meteor Burst Technology

SNOTEL uses meteor burst communications technology to collect and communicate data in near-real-time. VHF radio signals are reflected at a steep angle off the ever present band of ionized meteorites existing from about 50 to 75 miles above the earth. Satellites are not involved; NRCS operates and control the entire system.

An available map shows the locations of over 600 SNOTEL sites in 11 western states including Alaska. The sites are generally located in remote high-mountain watersheds where access is often difficult or restricted. Access for maintenance by NRCS includes various modes from hiking and skiing to helicopters.

Sites are designed to operate unattended and without maintenance for a year. They are battery powered with solar cell recharge. The condition of each site is monitored daily when it reports on 8 operational functions. Serious problems or deteriorating performance trigger a response from the NRCS electronic technicians located in 6 Data Collection Offices.

The SNOTEL sites are polled by 2 master stations operated by NRCS in Boise, Idaho, and Ogden, Utah. A central computer at NRCS's National Water and Climate Center (NWCC) in Portland, Oregon controls system operations and receives the data collected by the SNOTEL network.

New SNOTEL System Capabilities

Basic SNOTEL sites have a pressure sensing snow pillow, storage precipitation gage, and air temperature sensor. However, they can accommodate 64 channels of data and will accept analog, parallel, or serial digital sensors. On-site microprocessors provide functions such as computing daily maximum, minimum, and average temperature information. Generally, sensor data is recorded every 15 minutes and reported out in a daily poll of all sites. Special polls are conducted more frequently in response to specific needs.

The new generation of remote sites, master stations, and central computer facilities allows for hourly interrogation of remote sites. The system has the ability to vary the configuration of a remote site by transmitting the appropriate commands telling the remote site what sensors to turn on or what parameters to send.

A variety of calculations can be made on any sensor channel. For example, the user can select maximum, minimum, average, standard deviation, or circular averaging.

Each sensor can be accessed independently at a specific interval. For example, wind speed may be sensed every minute during the day to arrive at an average, while the snow pillow may be accessed every 15 minutes for the accumulated total.

System performance has increased over the years, mainly due to a better understanding of meteor burst communication characteristics and improved equipment.

While a 95 percent response to a system- wide poll is the standard, over 99 percent is common.

Data Storage, Management and Accessibility

All data are received by the SNOTEL central computer, which in turn is linked to the Centralized Forecasting System (CFS) in the NWCC where data can be accessed. Once on CFS, the data are in a relational database, where various analysis and graphics programs are available. Current and historical data and analyses are available by dialing in to the CFS, by disk or tape media, paper copy, or more recently via NWCC homepage and internet.

While carrying out the agency mission is paramount, NRCS is interested in supporting the research and operational data collection needs of others. The current system offers excellent opportunities.

For More Information

For more information in Washington, contact:

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Washington Snow Survey Homepage: <http://www.wa.nrcs.usda.gov.nrcs.CoopSnoSrvy.htm>

For additional information, contact the NRCS State Office in any of the western states or:

Snow Survey and Water Supply Forecasting Program Manager
Natural Resources Conservation Service
101 SW Main Street, Suite 1600
Portland, Oregon 97204-3224.
Telephone: 503-414-3107

NWCC Homepage URL: <http://www.wcc.nrcs.usda.gov/>

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The Following Organizations Cooperate with the Natural Resources Conservation Service in Snow Survey Work*:

Canada	Ministry of the Environment Investigations Branch, Victoria, British Columbia
State	Washington State Department of Ecology Washington State Department of Natural Resources
Federal	Department of the Army Corps of Engineers U.S. Department of Agriculture Forest Service U.S. Department of Commerce NOAA, National Weather Service U.S. Department of Interior Bonneville Power Administration Bureau of Reclamation Geological Survey National Park Service Bureau of Indian Affairs
Local	City of Tacoma City of Seattle Chelan County P.U.D. Pacific Power and Light Company Puget Sound Power and Light Company Washington Water Power Company Snohomish County P.U.D. Colville Confederated Tribes Spokane County Yakama Indian Nation Whatcom County Pierce County
Private	Okanogan Irrigation District Wenatchee Heights Irrigation District Newman Lake Homeowners Association Whitestone Reclamation District

*Other organizations and individuals furnish valuable information for the snow survey reports. Their cooperation is gratefully acknowledged.



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